



Cush Wind Farm  
Phase II

## Environmental Impact Assessment Report

# **Annex 13.2: Project-Alone Shadow Flicker Modelling Results**

Cush Wind Limited

## SHADOW - Main Result

**Calculation:** Cush - Enercon E175**Assumptions for shadow calculations**

Maximum distance for influence 1. WTG distance circle radius

|                                               |           |
|-----------------------------------------------|-----------|
| 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) [BIRR]

|      |      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| 1.57 | 2.08 | 2.82 | 4.36 | 5.20 | 4.37 | 4.15 | 3.90 | 3.54 | 2.68 | 1.94 | 1.23 |

Operational time

|     |     |     |     |     |     |     |     |       |     |       |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-------|-----|-------|-----|
| N   | NNE | NE  | ENE | E   | ESE | SE  | SSE | S     | SSW | SW    | WSW |
| 297 | 221 | 328 | 510 | 236 | 166 | 281 | 856 | 1,081 | 898 | 1,029 | 889 |

|     |     |     |     |       |
|-----|-----|-----|-----|-------|
| W   | WNW | NW  | NNW | Sum   |
| 735 | 495 | 400 | 338 | 8,760 |

Yearly aggregation of real case reduction

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:  
DHM: Elevation Grid Data Object: Cush Wind Farm\_(SHADOW FLICKER CALC  
Receptor grid resolution: 1.0 m

All coordinates are in

Irish ITM-IRENET95 (IE), geocentric, GRS80

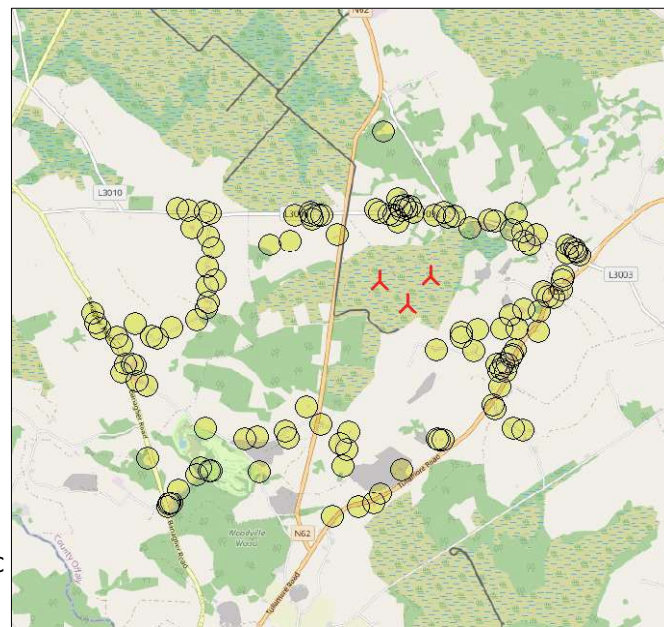
**WTGs**

|   | Easting | Northing | Z    | Row data/Description | WTG type |           |                    | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Shadow data              |           |
|---|---------|----------|------|----------------------|----------|-----------|--------------------|-------------------|--------------------|----------------|--------------------------|-----------|
|   |         |          |      |                      | Valid    | Manufact. | Type-generator     |                   |                    |                | Calculation distance [m] | RPM [RPM] |
| 1 | 608,636 | 710,729  | 51.3 | T9                   | Yes      | ENERCON   | E-175 EP5 E2-7,000 | 7,000             | 175.0              | 111.6          | 1,750                    | -         |
| 2 | 608,275 | 711,034  | 49.8 | T10                  | Yes      | ENERCON   | E-175 EP5 E2-7,000 | 7,000             | 175.0              | 111.6          | 1,750                    | -         |
| 3 | 608,944 | 711,100  | 50.8 | T11                  | Yes      | ENERCON   | E-175 EP5 E2-7,000 | 7,000             | 175.0              | 111.6          | 1,750                    | -         |

**Shadow receptor-Input**

| 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]                     |
| A   | H1   | 604,473 | 710,611  | 53.0 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| B   | H2   | 604,513 | 710,481  | 51.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| C   | H3   | 604,560 | 710,397  | 49.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| D   | H4   | 604,793 | 710,300  | 50.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| E   | H5   | 604,868 | 710,199  | 49.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| F   | H6   | 605,037 | 710,465  | 51.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| G   | H7   | 605,253 | 710,310  | 49.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| H   | H8   | 605,337 | 710,277  | 48.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| I   | H9   | 605,512 | 710,429  | 52.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| J   | H10  | 605,848 | 710,529  | 54.5 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| K   | H11  | 605,980 | 710,676  | 57.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| L   | H12  | 606,002 | 710,762  | 55.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| M   | H13  | 605,991 | 710,967  | 56.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| N   | H14  | 606,089 | 711,041  | 56.5 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| O   | H15  | 605,992 | 711,219  | 59.3 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| P   | H16  | 606,072 | 711,473  | 57.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| Q   | H17  | 605,999 | 711,625  | 59.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| R   | H18  | 605,781 | 711,736  | 55.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| S   | H19  | 605,597 | 711,988  | 54.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| T   | H20  | 605,735 | 711,966  | 55.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| U   | H21  | 605,958 | 711,958  | 59.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| V   | H22  | 606,031 | 711,938  | 60.3 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| W   | H23  | 606,821 | 711,514  | 58.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| X   | H24  | 607,091 | 711,562  | 60.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| Y   | H25  | 607,141 | 711,906  | 58.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |

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New WTG

Scale 1:100,000  
Shadow receptor

**SHADOW - Main Result****Calculation:** Cush - Enercon E175

...continued from previous page

| No. | Name | 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]                        |
| Z   | H26  | 607,355 | 711,953  | 61.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AA  | H27  | 607,369 | 711,920  | 61.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AB  | H28  | 607,377 | 711,858  | 61.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AC  | H29  | 607,458 | 711,911  | 61.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AD  | H30  | 607,501 | 711,911  | 60.2 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AE  | H31  | 607,709 | 711,650  | 61.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AF  | H32  | 608,211 | 711,989  | 64.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AG  | H33  | 608,276 | 711,954  | 66.4 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AH  | H34  | 608,399 | 711,924  | 65.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AI  | H35  | 608,462 | 711,916  | 64.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AJ  | H36  | 608,510 | 711,820  | 61.0 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AK  | H37  | 608,516 | 712,123  | 61.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AL  | H38  | 608,533 | 712,036  | 62.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AM  | H39  | 608,552 | 711,973  | 62.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AN  | H40  | 608,602 | 712,041  | 59.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AO  | H41  | 608,622 | 711,992  | 59.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AP  | H42  | 608,682 | 712,035  | 57.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AQ  | H43  | 608,717 | 711,950  | 60.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AR  | H44  | 608,993 | 711,913  | 62.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AS  | H45  | 609,115 | 711,957  | 60.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AT  | H46  | 609,273 | 711,896  | 66.0 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AU  | H47  | 609,461 | 711,748  | 60.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AV  | H48  | 610,385 | 710,654  | 69.2 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AW  | H49  | 610,174 | 710,669  | 71.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AX  | H50  | 610,370 | 710,379  | 64.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AY  | H51  | 610,101 | 710,420  | 67.1 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AZ  | H52  | 610,007 | 710,586  | 73.0 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BA  | H53  | 609,898 | 710,417  | 70.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BB  | H54  | 609,568 | 710,399  | 63.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BC  | H55  | 609,356 | 710,359  | 62.4 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BD  | H56  | 609,348 | 710,291  | 61.4 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BE  | H57  | 609,016 | 710,126  | 66.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BF  | H58  | 609,526 | 710,119  | 61.4 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BG  | H59  | 610,067 | 710,128  | 64.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BH  | H60  | 610,030 | 710,061  | 64.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BI  | H61  | 610,018 | 710,045  | 64.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BJ  | H62  | 609,974 | 709,951  | 63.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BK  | H63  | 609,911 | 709,957  | 62.2 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BL  | H64  | 609,820 | 709,935  | 58.4 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BM  | H65  | 609,879 | 709,876  | 61.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BN  | H66  | 609,858 | 709,846  | 59.6 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BO  | H67  | 609,939 | 709,852  | 62.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BP  | H68  | 609,872 | 709,638  | 60.0 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BQ  | H69  | 609,779 | 709,404  | 58.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BR  | H70  | 609,799 | 709,337  | 58.2 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BS  | H71  | 610,049 | 709,089  | 58.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BT  | H72  | 610,169 | 709,063  | 60.1 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BU  | H73  | 609,109 | 708,940  | 66.1 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BV  | H74  | 609,072 | 708,937  | 67.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BW  | H75  | 609,042 | 708,947  | 67.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BX  | H76  | 608,569 | 708,536  | 64.1 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BY  | H77  | 608,285 | 708,227  | 67.1 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BZ  | H78  | 608,198 | 708,088  | 66.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CA  | H79  | 608,005 | 708,038  | 67.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CB  | H80  | 607,662 | 707,913  | 68.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CC  | H81  | 607,865 | 709,036  | 53.2 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CD  | H82  | 607,751 | 708,884  | 55.9 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CE  | H83  | 607,490 | 709,143  | 59.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CF  | H84  | 607,310 | 709,373  | 55.7 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CG  | H85  | 607,027 | 709,054  | 55.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CH  | H86  | 606,680 | 708,508  | 58.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CI  | H87  | 606,657 | 708,968  | 52.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CJ  | H88  | 606,500 | 708,943  | 59.8 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CK  | H89  | 606,051 | 708,521  | 56.3 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |

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**SHADOW - Main Result****Calculation:** Cush - Enercon E175

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| No.     | Name    | 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]                        |
| CL H90  | 606,024 | 708,520 | 56.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CM H91  | 605,909 | 708,570 | 54.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CN H92  | 605,851 | 708,477 | 52.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CO H93  | 605,608 | 708,265 | 47.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CP H94  | 605,525 | 708,100 | 46.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CQ H95  | 605,497 | 708,087 | 46.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CR H96  | 605,482 | 708,080 | 45.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CS H97  | 605,473 | 708,043 | 45.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CT H98  | 605,197 | 708,689 | 48.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CU H99  | 605,962 | 709,085 | 59.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CV H100 | 605,189 | 709,640 | 51.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CW H101 | 605,060 | 709,718 | 50.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CX H102 | 605,034 | 709,921 | 48.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CY H103 | 604,999 | 709,941 | 48.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CZ H104 | 604,907 | 709,932 | 50.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DA H105 | 604,855 | 709,831 | 49.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DB H106 | 607,073 | 708,957 | 54.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DC H107 | 608,313 | 713,012 | 58.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DD H108 | 609,726 | 711,851 | 64.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DE H109 | 609,792 | 711,845 | 64.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DF H110 | 610,079 | 711,939 | 58.5     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DG H111 | 610,012 | 711,725 | 61.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DH H112 | 610,164 | 711,708 | 63.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DI H113 | 610,193 | 711,561 | 70.0     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DJ H114 | 610,262 | 711,519 | 71.5     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DK H115 | 610,347 | 711,661 | 74.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DL H116 | 610,755 | 711,406 | 75.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DM H117 | 610,752 | 711,516 | 79.9     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DN H118 | 610,821 | 711,492 | 79.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DO H119 | 610,858 | 711,474 | 77.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DP H120 | 610,870 | 711,435 | 74.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DQ H121 | 610,894 | 711,417 | 71.7     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DR H122 | 610,919 | 711,381 | 68.8     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DS H123 | 610,707 | 711,093 | 72.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DT H124 | 610,693 | 711,056 | 72.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DU H125 | 610,580 | 710,824 | 69.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DV H126 | 610,689 | 710,922 | 72.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DW H127 | 610,504 | 710,833 | 72.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DX H128 | 610,445 | 710,905 | 73.0     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DY H129 | 609,178 | 711,885 | 63.9     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DZ H130 | 607,835 | 708,810 | 61.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| EA H131 | 607,797 | 708,599 | 56.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |

**Calculation Results**

Shadow receptor

| No.   | Name | Shadow, worst case                   |                                        | Shadow, expected values                |                                      |
|-------|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|
|       |      | 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] | Shadow hours<br>per year<br>[h/year] |
| A H1  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| B H2  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| C H3  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| D H4  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| E H5  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| F H6  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| 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 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| M H13 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| N H14 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |

To be continued on next page...

**SHADOW - Main Result****Calculation:** Cush - Enercon E175

...continued from previous page

| No. | Name   | Shadow, worst case                   |                                        | Max shadow<br>hours per day<br>[h/day] | Shadow, expected values              |  |
|-----|--------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|--|
|     |        | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] |                                        | Shadow hours<br>per year<br>[h/year] |  |
|     | O H15  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | P H16  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | Q H17  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | R H18  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | S H19  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | T H20  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | U H21  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | V H22  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | W H23  | 7:51                                 | 31                                     | 0:25                                   | 1:06                                 |  |
|     | X H24  | 12:44                                | 38                                     | 0:31                                   | 1:44                                 |  |
|     | Y H25  | 13:33                                | 44                                     | 0:29                                   | 1:40                                 |  |
|     | Z H26  | 27:14                                | 81                                     | 0:33                                   | 3:09                                 |  |
|     | AA H27 | 27:19                                | 84                                     | 0:35                                   | 3:12                                 |  |
|     | AB H28 | 30:43                                | 99                                     | 0:35                                   | 3:49                                 |  |
|     | AC H29 | 43:14                                | 108                                    | 0:40                                   | 5:02                                 |  |
|     | AD H30 | 48:04                                | 106                                    | 0:43                                   | 5:32                                 |  |
|     | AE H31 | 81:43                                | 139                                    | 0:57                                   | 9:47                                 |  |
|     | AF H32 | 38:05                                | 70                                     | 0:38                                   | 4:09                                 |  |
|     | AG H33 | 39:43                                | 68                                     | 0:41                                   | 4:18                                 |  |
|     | AH H34 | 36:06                                | 62                                     | 0:43                                   | 3:49                                 |  |
|     | AI H35 | 32:34                                | 56                                     | 0:43                                   | 3:27                                 |  |
|     | AJ H36 | 66:03                                | 72                                     | 1:25                                   | 7:23                                 |  |
|     | AK H37 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AL H38 | 3:01                                 | 16                                     | 0:14                                   | 0:18                                 |  |
|     | AM H39 | 12:31                                | 33                                     | 0:29                                   | 1:18                                 |  |
|     | AN H40 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AO H41 | 3:04                                 | 16                                     | 0:15                                   | 0:19                                 |  |
|     | AP H42 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AQ H43 | 12:07                                | 32                                     | 0:34                                   | 1:24                                 |  |
|     | AR H44 | 39:18                                | 70                                     | 0:39                                   | 4:55                                 |  |
|     | AS H45 | 33:18                                | 76                                     | 0:35                                   | 4:16                                 |  |
|     | AT H46 | 37:13                                | 93                                     | 0:37                                   | 4:47                                 |  |
|     | AU H47 | 83:25                                | 122                                    | 0:53                                   | 11:04                                |  |
|     | AV H48 | 8:55                                 | 35                                     | 0:24                                   | 1:31                                 |  |
|     | AW H49 | 21:01                                | 73                                     | 0:30                                   | 3:36                                 |  |
|     | AX H50 | 12:14                                | 48                                     | 0:24                                   | 2:05                                 |  |
|     | AY H51 | 38:31                                | 112                                    | 0:31                                   | 6:06                                 |  |
|     | AZ H52 | 37:25                                | 111                                    | 0:34                                   | 6:19                                 |  |
|     | BA H53 | 34:00                                | 113                                    | 0:31                                   | 5:28                                 |  |
|     | BB H54 | 48:30                                | 84                                     | 0:56                                   | 8:18                                 |  |
|     | BC H55 | 78:57                                | 98                                     | 1:06                                   | 12:32                                |  |
|     | BD H56 | 48:37                                | 79                                     | 0:52                                   | 7:31                                 |  |
|     | BE H57 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BF H58 | 23:02                                | 61                                     | 0:32                                   | 3:28                                 |  |
|     | BG H59 | 10:41                                | 41                                     | 0:25                                   | 1:50                                 |  |
|     | BH H60 | 12:36                                | 48                                     | 0:25                                   | 2:09                                 |  |
|     | BI H61 | 13:19                                | 49                                     | 0:25                                   | 2:16                                 |  |
|     | BJ H62 | 23:02                                | 78                                     | 0:26                                   | 3:37                                 |  |
|     | BK H63 | 25:05                                | 74                                     | 0:27                                   | 3:53                                 |  |
|     | BL H64 | 18:57                                | 60                                     | 0:27                                   | 2:51                                 |  |
|     | BM H65 | 15:00                                | 56                                     | 0:23                                   | 2:14                                 |  |
|     | BN H66 | 9:50                                 | 47                                     | 0:18                                   | 1:28                                 |  |
|     | BO H67 | 16:06                                | 59                                     | 0:24                                   | 2:25                                 |  |
|     | BP H68 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BQ H69 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BR H70 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BS H71 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BT H72 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BU H73 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BV H74 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BW H75 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BX H76 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BY H77 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |

To be continued on next page...

**SHADOW - Main Result****Calculation:** Cush - Enercon E175

...continued from previous page

| No. | Name | Shadow, worst case                   |                                        | Max shadow<br>hours per day<br>[h/day] | Shadow, expected values              |  |
|-----|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|--|
|     |      | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] |                                        | Shadow hours<br>per year<br>[h/year] |  |
| BZ  | H78  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CA  | H79  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CB  | H80  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CC  | H81  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CD  | H82  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CE  | H83  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CF  | H84  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CG  | H85  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CH  | H86  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CI  | H87  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CJ  | H88  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CK  | H89  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CL  | H90  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CM  | H91  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CN  | H92  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CO  | H93  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CP  | H94  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CQ  | H95  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CR  | H96  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CS  | H97  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CT  | H98  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CU  | H99  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CV  | H100 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CW  | H101 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CX  | H102 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CY  | H103 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CZ  | H104 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DA  | H105 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DB  | H106 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DC  | H107 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DD  | H108 | 43:04                                | 120                                    | 0:40                                   | 5:54                                 |  |
| DE  | H109 | 35:38                                | 108                                    | 0:38                                   | 4:59                                 |  |
| DF  | H110 | 13:10                                | 44                                     | 0:29                                   | 1:50                                 |  |
| DG  | H111 | 21:38                                | 62                                     | 0:33                                   | 3:06                                 |  |
| DH  | H112 | 11:08                                | 38                                     | 0:29                                   | 1:38                                 |  |
| DI  | H113 | 10:11                                | 35                                     | 0:28                                   | 1:31                                 |  |
| DJ  | H114 | 8:53                                 | 32                                     | 0:27                                   | 1:20                                 |  |
| DK  | H115 | 6:52                                 | 29                                     | 0:23                                   | 1:00                                 |  |
| DL  | H116 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DM  | H117 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DN  | H118 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DO  | H119 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DP  | H120 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DQ  | H121 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DR  | H122 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DS  | H123 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DT  | H124 | 4:15                                 | 24                                     | 0:17                                   | 0:42                                 |  |
| DU  | H125 | 5:34                                 | 26                                     | 0:20                                   | 0:56                                 |  |
| DV  | H126 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DW  | H127 | 6:19                                 | 28                                     | 0:21                                   | 1:04                                 |  |
| DX  | H128 | 6:58                                 | 30                                     | 0:23                                   | 1:11                                 |  |
| DY  | H129 | 36:56                                | 88                                     | 0:34                                   | 4:48                                 |  |
| DZ  | H130 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| EA  | H131 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |

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

| No. | Name | Worst case<br>[h/year] | Expected<br>[h/year] |
|-----|------|------------------------|----------------------|
| 1   | T9   | 207:47                 | 30:23                |
| 2   | T10  | 260:04                 | 34:19                |
| 3   | T11  | 365:35                 | 48:46                |

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.

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## SHADOW - Main Result

**Calculation:** Cush - GE164**Assumptions for shadow calculations**

Maximum distance for influence 1. WTG distance circle radius

|                                               |           |
|-----------------------------------------------|-----------|
| 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) [BIRR]

|      |      |      |      |      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|------|------|------|------|
| Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
| 1.57 | 2.08 | 2.82 | 4.36 | 5.20 | 4.37 | 4.15 | 3.90 | 3.54 | 2.68 | 1.94 | 1.23 |

Operational time

|     |     |     |     |     |     |     |     |       |     |       |     |
|-----|-----|-----|-----|-----|-----|-----|-----|-------|-----|-------|-----|
| N   | NNE | NE  | ENE | E   | ESE | SE  | SSE | S     | SSW | SW    | WSW |
| 297 | 221 | 328 | 510 | 236 | 166 | 281 | 856 | 1,081 | 898 | 1,029 | 889 |

|     |     |     |     |       |
|-----|-----|-----|-----|-------|
| W   | WNW | NW  | NNW | Sum   |
| 735 | 495 | 400 | 338 | 8,760 |

Yearly aggregation of real case reduction

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:  
DHM: Elevation Grid Data Object: Cush Wind Farm\_(SHADOW FLICKER CALC  
Receptor grid resolution: 1.0 m

All coordinates are in

Irish ITM-IRENET95 (IE), geocentric, GRS80

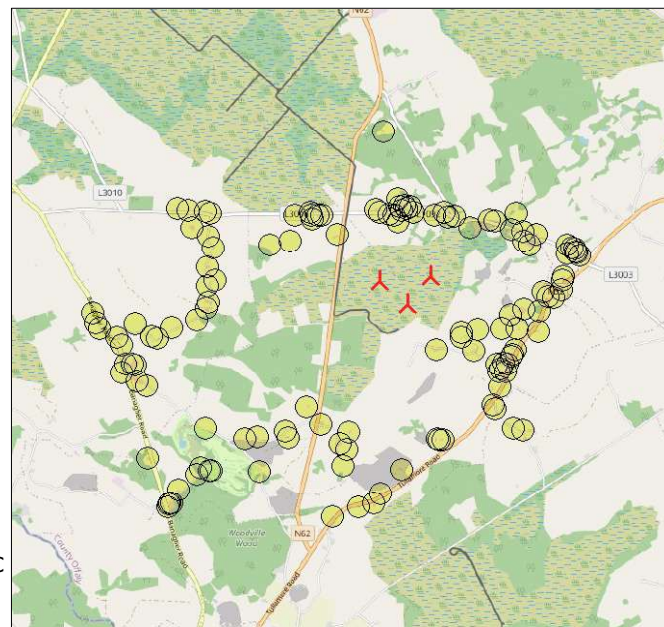
**WTGs**

|   | Easting | Northing | Z    | Row data/Description | WTG type |            | Type-generator    | Power, rated | Rotor diameter | Hub height | Shadow data          |       |
|---|---------|----------|------|----------------------|----------|------------|-------------------|--------------|----------------|------------|----------------------|-------|
|   |         |          |      |                      | Valid    | Manufact.  |                   |              |                |            | Calculation distance | RPM   |
|   |         |          | [m]  |                      |          |            |                   | [kW]         | [m]            | [m]        | [m]                  | [RPM] |
| 1 | 608,636 | 710,729  | 51.3 | T9                   | Yes      | GE Vernova | GEV 6.5-164-6,500 | 6,500        | 164.0          | 118.0      | 1,640                | -     |
| 2 | 608,275 | 711,034  | 49.8 | T10                  | Yes      | GE Vernova | GEV 6.5-164-6,500 | 6,500        | 164.0          | 118.0      | 1,640                | -     |
| 3 | 608,944 | 711,100  | 50.8 | T11                  | Yes      | GE Vernova | GEV 6.5-164-6,500 | 6,500        | 164.0          | 118.0      | 1,640                | -     |

**Shadow receptor-Input**

| 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]                     |
| A   | H1   | 604,473 | 710,611  | 53.0 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| B   | H2   | 604,513 | 710,481  | 51.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| C   | H3   | 604,560 | 710,397  | 49.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| D   | H4   | 604,793 | 710,300  | 50.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| E   | H5   | 604,868 | 710,199  | 49.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| F   | H6   | 605,037 | 710,465  | 51.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| G   | H7   | 605,253 | 710,310  | 49.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| H   | H8   | 605,337 | 710,277  | 48.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| I   | H9   | 605,512 | 710,429  | 52.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| J   | H10  | 605,848 | 710,529  | 54.5 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| K   | H11  | 605,980 | 710,676  | 57.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| L   | H12  | 606,002 | 710,762  | 55.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| M   | H13  | 605,991 | 710,967  | 56.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| N   | H14  | 606,089 | 711,041  | 56.5 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| O   | H15  | 605,992 | 711,219  | 59.3 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| P   | H16  | 606,072 | 711,473  | 57.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| Q   | H17  | 605,999 | 711,625  | 59.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| R   | H18  | 605,781 | 711,736  | 55.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| S   | H19  | 605,597 | 711,988  | 54.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| T   | H20  | 605,735 | 711,966  | 55.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| U   | H21  | 605,958 | 711,958  | 59.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| V   | H22  | 606,031 | 711,938  | 60.3 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| W   | H23  | 606,821 | 711,514  | 58.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| X   | H24  | 607,091 | 711,562  | 60.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| Y   | H25  | 607,141 | 711,906  | 58.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |

To be continued on next page...



New WTG

Scale 1:100,000  
Shadow receptor

**SHADOW - Main Result****Calculation:** Cush - GE164

...continued from previous page

| No.    | Name    | 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]                        |
| Z H26  | 607,355 | 711,953 | 61.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AA H27 | 607,369 | 711,920 | 61.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AB H28 | 607,377 | 711,858 | 61.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AC H29 | 607,458 | 711,911 | 61.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AD H30 | 607,501 | 711,911 | 60.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AE H31 | 607,709 | 711,650 | 61.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AF H32 | 608,211 | 711,989 | 64.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AG H33 | 608,276 | 711,954 | 66.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AH H34 | 608,399 | 711,924 | 65.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AI H35 | 608,462 | 711,916 | 64.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AJ H36 | 608,510 | 711,820 | 61.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AK H37 | 608,516 | 712,123 | 61.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AL H38 | 608,533 | 712,036 | 62.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AM H39 | 608,552 | 711,973 | 62.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AN H40 | 608,602 | 712,041 | 59.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AO H41 | 608,622 | 711,992 | 59.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AP H42 | 608,682 | 712,035 | 57.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AQ H43 | 608,717 | 711,950 | 60.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AR H44 | 608,993 | 711,913 | 62.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AS H45 | 609,115 | 711,957 | 60.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AT H46 | 609,273 | 711,896 | 66.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AU H47 | 609,461 | 711,748 | 60.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AV H48 | 610,385 | 710,654 | 69.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AW H49 | 610,174 | 710,669 | 71.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AX H50 | 610,370 | 710,379 | 64.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AY H51 | 610,101 | 710,420 | 67.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| AZ H52 | 610,007 | 710,586 | 73.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BA H53 | 609,898 | 710,417 | 70.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BB H54 | 609,568 | 710,399 | 63.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BC H55 | 609,356 | 710,359 | 62.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BD H56 | 609,348 | 710,291 | 61.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BE H57 | 609,016 | 710,126 | 66.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BF H58 | 609,526 | 710,119 | 61.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BG H59 | 610,067 | 710,128 | 64.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BH H60 | 610,030 | 710,061 | 64.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BI H61 | 610,018 | 710,045 | 64.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BJ H62 | 609,974 | 709,951 | 63.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BK H63 | 609,911 | 709,957 | 62.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BL H64 | 609,820 | 709,935 | 58.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BM H65 | 609,879 | 709,876 | 61.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BN H66 | 609,858 | 709,846 | 59.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BO H67 | 609,939 | 709,852 | 62.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BP H68 | 609,872 | 709,638 | 60.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BQ H69 | 609,779 | 709,404 | 58.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BR H70 | 609,799 | 709,337 | 58.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BS H71 | 610,049 | 709,089 | 58.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BT H72 | 610,169 | 709,063 | 60.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BU H73 | 609,109 | 708,940 | 66.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BV H74 | 609,072 | 708,937 | 67.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BW H75 | 609,042 | 708,947 | 67.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BX H76 | 608,569 | 708,536 | 64.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BY H77 | 608,285 | 708,227 | 67.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| BZ H78 | 608,198 | 708,088 | 66.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CA H79 | 608,005 | 708,038 | 67.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CB H80 | 607,662 | 707,913 | 68.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CC H81 | 607,865 | 709,036 | 53.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CD H82 | 607,751 | 708,884 | 55.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CE H83 | 607,490 | 709,143 | 59.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CF H84 | 607,310 | 709,373 | 55.7     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CG H85 | 607,027 | 709,054 | 55.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CH H86 | 606,680 | 708,508 | 58.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CI H87 | 606,657 | 708,968 | 52.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CJ H88 | 606,500 | 708,943 | 59.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CK H89 | 606,051 | 708,521 | 56.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |

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**SHADOW - Main Result****Calculation:** Cush - GE164

...continued from previous page

| No.     | Name    | 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]                        |
| CL H90  | 606,024 | 708,520 | 56.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CM H91  | 605,909 | 708,570 | 54.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CN H92  | 605,851 | 708,477 | 52.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CO H93  | 605,608 | 708,265 | 47.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CP H94  | 605,525 | 708,100 | 46.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CQ H95  | 605,497 | 708,087 | 46.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CR H96  | 605,482 | 708,080 | 45.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CS H97  | 605,473 | 708,043 | 45.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CT H98  | 605,197 | 708,689 | 48.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CU H99  | 605,962 | 709,085 | 59.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CV H100 | 605,189 | 709,640 | 51.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CW H101 | 605,060 | 709,718 | 50.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CX H102 | 605,034 | 709,921 | 48.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CY H103 | 604,999 | 709,941 | 48.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CZ H104 | 604,907 | 709,932 | 50.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DA H105 | 604,855 | 709,831 | 49.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DB H106 | 607,073 | 708,957 | 54.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DC H107 | 608,313 | 713,012 | 58.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DD H108 | 609,726 | 711,851 | 64.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DE H109 | 609,792 | 711,845 | 64.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DF H110 | 610,079 | 711,939 | 58.5     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DG H111 | 610,012 | 711,725 | 61.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DH H112 | 610,164 | 711,708 | 63.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DI H113 | 610,193 | 711,561 | 70.0     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DJ H114 | 610,262 | 711,519 | 71.5     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DK H115 | 610,347 | 711,661 | 74.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DL H116 | 610,755 | 711,406 | 75.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DM H117 | 610,752 | 711,516 | 79.9     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DN H118 | 610,821 | 711,492 | 79.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DO H119 | 610,858 | 711,474 | 77.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DP H120 | 610,870 | 711,435 | 74.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DQ H121 | 610,894 | 711,417 | 71.7     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DR H122 | 610,919 | 711,381 | 68.8     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DS H123 | 610,707 | 711,093 | 72.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DT H124 | 610,693 | 711,056 | 72.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DU H125 | 610,580 | 710,824 | 69.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DV H126 | 610,689 | 710,922 | 72.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DW H127 | 610,504 | 710,833 | 72.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DX H128 | 610,445 | 710,905 | 73.0     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DY H129 | 609,178 | 711,885 | 63.9     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DZ H130 | 607,835 | 708,810 | 61.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| EA H131 | 607,797 | 708,599 | 56.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |

**Calculation Results**

Shadow receptor

| No.   | Name | Shadow, worst case                   |                                        | Shadow, expected values                |                                      |
|-------|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|
|       |      | 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] | Shadow hours<br>per year<br>[h/year] |
| A H1  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| B H2  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| C H3  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| D H4  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| E H5  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| F H6  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| 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 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| M H13 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| N H14 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |

To be continued on next page...

**SHADOW - Main Result****Calculation:** Cush - GE164

...continued from previous page

| No. | Name | Shadow, worst case                   |                                        | Max shadow<br>hours per day<br>[h/day] | Shadow, expected values              |  |
|-----|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|--|
|     |      | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] |                                        | Shadow hours<br>per year<br>[h/year] |  |
| O   | H15  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| P   | H16  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| Q   | H17  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| R   | H18  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| S   | H19  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| T   | H20  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| U   | H21  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| V   | H22  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| W   | H23  | 7:27                                 | 30                                     | 0:24                                   | 1:03                                 |  |
| X   | H24  | 12:09                                | 38                                     | 0:30                                   | 1:39                                 |  |
| Y   | H25  | 12:50                                | 44                                     | 0:27                                   | 1:35                                 |  |
| Z   | H26  | 25:43                                | 82                                     | 0:32                                   | 2:59                                 |  |
| AA  | H27  | 25:23                                | 84                                     | 0:32                                   | 2:59                                 |  |
| AB  | H28  | 23:16                                | 68                                     | 0:33                                   | 2:50                                 |  |
| AC  | H29  | 34:06                                | 80                                     | 0:34                                   | 3:51                                 |  |
| AD  | H30  | 39:49                                | 76                                     | 0:41                                   | 4:27                                 |  |
| AE  | H31  | 78:16                                | 138                                    | 0:54                                   | 9:22                                 |  |
| AF  | H32  | 36:32                                | 70                                     | 0:36                                   | 3:58                                 |  |
| AG  | H33  | 37:41                                | 68                                     | 0:39                                   | 4:05                                 |  |
| AH  | H34  | 34:50                                | 62                                     | 0:41                                   | 3:42                                 |  |
| AI  | H35  | 31:21                                | 56                                     | 0:41                                   | 3:20                                 |  |
| AJ  | H36  | 63:48                                | 72                                     | 1:21                                   | 7:08                                 |  |
| AK  | H37  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| AL  | H38  | 3:15                                 | 17                                     | 0:15                                   | 0:19                                 |  |
| AM  | H39  | 12:34                                | 34                                     | 0:28                                   | 1:19                                 |  |
| AN  | H40  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| AO  | H41  | 3:24                                 | 17                                     | 0:15                                   | 0:21                                 |  |
| AP  | H42  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| AQ  | H43  | 12:33                                | 32                                     | 0:35                                   | 1:27                                 |  |
| AR  | H44  | 37:34                                | 70                                     | 0:37                                   | 4:42                                 |  |
| AS  | H45  | 32:01                                | 76                                     | 0:33                                   | 4:06                                 |  |
| AT  | H46  | 36:04                                | 93                                     | 0:36                                   | 4:38                                 |  |
| AU  | H47  | 78:25                                | 122                                    | 0:49                                   | 10:25                                |  |
| AV  | H48  | 8:30                                 | 35                                     | 0:23                                   | 1:26                                 |  |
| AW  | H49  | 20:11                                | 73                                     | 0:29                                   | 3:27                                 |  |
| AX  | H50  | 11:45                                | 48                                     | 0:23                                   | 2:00                                 |  |
| AY  | H51  | 36:57                                | 111                                    | 0:30                                   | 5:51                                 |  |
| AZ  | H52  | 35:43                                | 109                                    | 0:34                                   | 6:01                                 |  |
| BA  | H53  | 26:19                                | 92                                     | 0:29                                   | 4:09                                 |  |
| BB  | H54  | 47:00                                | 81                                     | 0:55                                   | 8:03                                 |  |
| BC  | H55  | 76:14                                | 94                                     | 1:05                                   | 12:05                                |  |
| BD  | H56  | 46:04                                | 74                                     | 0:52                                   | 7:06                                 |  |
| BE  | H57  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BF  | H58  | 21:36                                | 59                                     | 0:32                                   | 3:15                                 |  |
| BG  | H59  | 10:12                                | 41                                     | 0:24                                   | 1:45                                 |  |
| BH  | H60  | 12:03                                | 47                                     | 0:25                                   | 2:03                                 |  |
| BI  | H61  | 12:47                                | 49                                     | 0:24                                   | 2:10                                 |  |
| BJ  | H62  | 22:01                                | 77                                     | 0:25                                   | 3:28                                 |  |
| BK  | H63  | 24:07                                | 72                                     | 0:27                                   | 3:44                                 |  |
| BL  | H64  | 18:19                                | 59                                     | 0:27                                   | 2:45                                 |  |
| BM  | H65  | 14:27                                | 55                                     | 0:23                                   | 2:09                                 |  |
| BN  | H66  | 9:14                                 | 46                                     | 0:18                                   | 1:22                                 |  |
| BO  | H67  | 15:36                                | 57                                     | 0:24                                   | 2:20                                 |  |
| BP  | H68  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BQ  | H69  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BR  | H70  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BS  | H71  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BT  | H72  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BU  | H73  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BV  | H74  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BW  | H75  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BX  | H76  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| BY  | H77  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |

To be continued on next page...

**SHADOW - Main Result****Calculation:** Cush - GE164

...continued from previous page

| No. | Name | Shadow, worst case                   |                                        | Max shadow<br>hours per day<br>[h/day] | Shadow, expected values              |  |
|-----|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|--|
|     |      | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] |                                        | Shadow hours<br>per year<br>[h/year] |  |
| BZ  | H78  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CA  | H79  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CB  | H80  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CC  | H81  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CD  | H82  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CE  | H83  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CF  | H84  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CG  | H85  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CH  | H86  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CI  | H87  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CJ  | H88  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CK  | H89  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CL  | H90  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CM  | H91  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CN  | H92  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CO  | H93  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CP  | H94  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CQ  | H95  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CR  | H96  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CS  | H97  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CT  | H98  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CU  | H99  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CV  | H100 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CW  | H101 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CX  | H102 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CY  | H103 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| CZ  | H104 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DA  | H105 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DB  | H106 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DC  | H107 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DD  | H108 | 34:58                                | 94                                     | 0:37                                   | 4:44                                 |  |
| DE  | H109 | 28:40                                | 83                                     | 0:36                                   | 3:59                                 |  |
| DF  | H110 | 12:36                                | 42                                     | 0:28                                   | 1:46                                 |  |
| DG  | H111 | 14:40                                | 42                                     | 0:31                                   | 2:08                                 |  |
| DH  | H112 | 10:36                                | 35                                     | 0:28                                   | 1:33                                 |  |
| DI  | H113 | 9:48                                 | 33                                     | 0:27                                   | 1:27                                 |  |
| DJ  | H114 | 8:30                                 | 31                                     | 0:26                                   | 1:16                                 |  |
| DK  | H115 | 6:38                                 | 28                                     | 0:23                                   | 0:58                                 |  |
| DL  | H116 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DM  | H117 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DN  | H118 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DO  | H119 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DP  | H120 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DQ  | H121 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DR  | H122 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DS  | H123 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DT  | H124 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DU  | H125 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DV  | H126 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| DW  | H127 | 6:04                                 | 28                                     | 0:21                                   | 1:01                                 |  |
| DX  | H128 | 6:42                                 | 30                                     | 0:22                                   | 1:09                                 |  |
| DY  | H129 | 35:27                                | 88                                     | 0:32                                   | 4:37                                 |  |
| DZ  | H130 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
| EA  | H131 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |

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

| No. | Name | Worst case<br>[h/year] | Expected<br>[h/year] |
|-----|------|------------------------|----------------------|
| 1   | T9   | 195:12                 | 28:43                |
| 2   | T10  | 248:00                 | 32:31                |
| 3   | T11  | 353:10                 | 47:01                |

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.

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## SHADOW - Main Result

**Calculation:** Cush - GE158

### Assumptions for shadow calculations

Maximum distance for influence 1. WTG distance circle radius

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) [BIRR]

| Jan  | Feb  | Mar  | Apr  | May  | Jun  | Jul  | Aug  | Sep  | Oct  | Nov  | Dec  |
|------|------|------|------|------|------|------|------|------|------|------|------|
| 1.57 | 2.08 | 2.82 | 4.36 | 5.20 | 4.37 | 4.15 | 3.90 | 3.54 | 2.68 | 1.94 | 1.23 |

Operational time

| N   | NNE | NE  | ENE | E   | ESE | SE  | SSE | S     | SSW | SW    | WSW |
|-----|-----|-----|-----|-----|-----|-----|-----|-------|-----|-------|-----|
| 297 | 221 | 328 | 510 | 236 | 166 | 281 | 856 | 1,081 | 898 | 1,029 | 889 |

| W   | WNW | NW  | NNW | Sum   |
|-----|-----|-----|-----|-------|
| 735 | 495 | 400 | 338 | 8,760 |

Yearly aggregation of real case reduction

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:  
DHM: Elevation Grid Data Object: Cush Wind Farm\_(SHADOW FLICKER CALC  
Receptor grid resolution: 1.0 m

All coordinates are in

Irish ITM-IRENET95 (IE), geocentric, GRS80

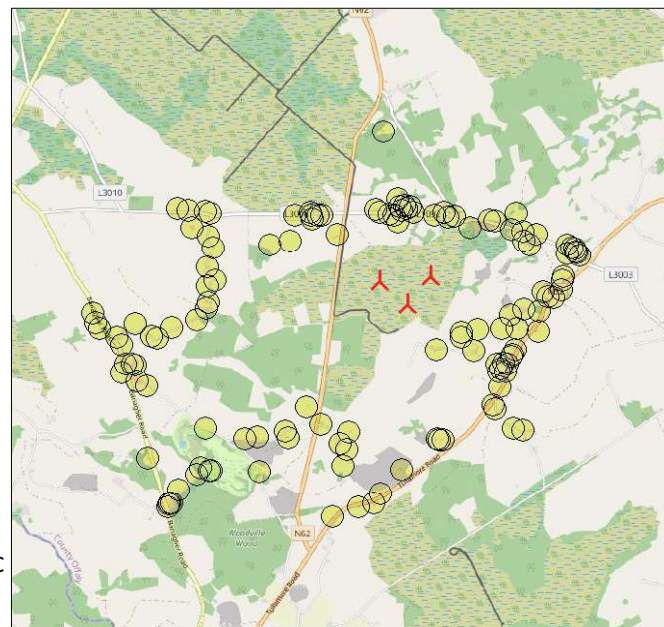
### WTGs

|   | Easting | Northing | Z    | Row data/Description | WTG type |                | Type-generator | Power, rated [kW] | Rotor diameter [m] | Hub height [m] | Shadow data              |           |
|---|---------|----------|------|----------------------|----------|----------------|----------------|-------------------|--------------------|----------------|--------------------------|-----------|
|   |         |          |      |                      | Valid    | Manufact.      |                |                   |                    |                | Calculation distance [m] | RPM [RPM] |
| 1 | 608,636 | 710,729  | 51.3 | T9                   | Yes      | GE WIND ENERGY | 6.1-158 -6,100 | 6,100             | 158.0              | 120.9          | 1,580                    | -         |
| 2 | 608,275 | 711,034  | 49.8 | T10                  | Yes      | GE WIND ENERGY | 6.1-158 -6,100 | 6,100             | 158.0              | 120.9          | 1,580                    | -         |
| 3 | 608,944 | 711,100  | 50.8 | T11                  | Yes      | GE WIND ENERGY | 6.1-158 -6,100 | 6,100             | 158.0              | 120.9          | 1,580                    | -         |

### Shadow receptor-Input

| 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]                     |
| A   | H1   | 604,473 | 710,611  | 53.0 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| B   | H2   | 604,513 | 710,481  | 51.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| C   | H3   | 604,560 | 710,397  | 49.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| D   | H4   | 604,793 | 710,300  | 50.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| E   | H5   | 604,868 | 710,199  | 49.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| F   | H6   | 605,037 | 710,465  | 51.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| G   | H7   | 605,253 | 710,310  | 49.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| H   | H8   | 605,337 | 710,277  | 48.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| I   | H9   | 605,512 | 710,429  | 52.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| J   | H10  | 605,848 | 710,529  | 54.5 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| K   | H11  | 605,980 | 710,676  | 57.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| L   | H12  | 606,002 | 710,762  | 55.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| M   | H13  | 605,991 | 710,967  | 56.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| N   | H14  | 606,089 | 711,041  | 56.5 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| O   | H15  | 605,992 | 711,219  | 59.3 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| P   | H16  | 606,072 | 711,473  | 57.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| Q   | H17  | 605,999 | 711,625  | 59.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| R   | H18  | 605,781 | 711,736  | 55.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| S   | H19  | 605,597 | 711,988  | 54.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| T   | H20  | 605,735 | 711,966  | 55.1 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| U   | H21  | 605,958 | 711,958  | 59.2 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| V   | H22  | 606,031 | 711,938  | 60.3 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| W   | H23  | 606,821 | 711,514  | 58.9 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| X   | H24  | 607,091 | 711,562  | 60.6 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |
| Y   | H25  | 607,141 | 711,906  | 58.4 | 1.5   | 1.5    | 0.5              | 90.0            | "Green house mode" | 2.0                     |

To be continued on next page...



Scale 1:100,000  
New WTG  
Shadow receptor

**SHADOW - Main Result****Calculation:** Cush - GE158

...continued from previous page

| No.    | Name    | 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]                        |
| Z H26  | 607,355 | 711,953 | 61.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AA H27 | 607,369 | 711,920 | 61.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AB H28 | 607,377 | 711,858 | 61.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AC H29 | 607,458 | 711,911 | 61.5     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AD H30 | 607,501 | 711,911 | 60.2     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AE H31 | 607,709 | 711,650 | 61.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AF H32 | 608,211 | 711,989 | 64.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AG H33 | 608,276 | 711,954 | 66.4     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AH H34 | 608,399 | 711,924 | 65.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AI H35 | 608,462 | 711,916 | 64.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AJ H36 | 608,510 | 711,820 | 61.0     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AK H37 | 608,516 | 712,123 | 61.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AL H38 | 608,533 | 712,036 | 62.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AM H39 | 608,552 | 711,973 | 62.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AN H40 | 608,602 | 712,041 | 59.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AO H41 | 608,622 | 711,992 | 59.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AP H42 | 608,682 | 712,035 | 57.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AQ H43 | 608,717 | 711,950 | 60.5     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AR H44 | 608,993 | 711,913 | 62.5     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AS H45 | 609,115 | 711,957 | 60.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AT H46 | 609,273 | 711,896 | 66.0     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AU H47 | 609,461 | 711,748 | 60.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AV H48 | 610,385 | 710,654 | 69.2     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AW H49 | 610,174 | 710,669 | 71.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AX H50 | 610,370 | 710,379 | 64.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AY H51 | 610,101 | 710,420 | 67.1     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| AZ H52 | 610,007 | 710,586 | 73.0     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BA H53 | 609,898 | 710,417 | 70.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BB H54 | 609,568 | 710,399 | 63.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BC H55 | 609,356 | 710,359 | 62.4     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BD H56 | 609,348 | 710,291 | 61.4     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BE H57 | 609,016 | 710,126 | 66.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BF H58 | 609,526 | 710,119 | 61.4     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BG H59 | 610,067 | 710,128 | 64.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BH H60 | 610,030 | 710,061 | 64.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BI H61 | 610,018 | 710,045 | 64.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BJ H62 | 609,974 | 709,951 | 63.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BK H63 | 609,911 | 709,957 | 62.2     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BL H64 | 609,820 | 709,935 | 58.4     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BM H65 | 609,879 | 709,876 | 61.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BN H66 | 609,858 | 709,846 | 59.6     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BO H67 | 609,939 | 709,852 | 62.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BP H68 | 609,872 | 709,638 | 60.0     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BQ H69 | 609,779 | 709,404 | 58.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BR H70 | 609,799 | 709,337 | 58.2     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BS H71 | 610,049 | 709,089 | 58.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BT H72 | 610,169 | 709,063 | 60.1     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BU H73 | 609,109 | 708,940 | 66.1     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BV H74 | 609,072 | 708,937 | 67.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BW H75 | 609,042 | 708,947 | 67.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BX H76 | 608,569 | 708,536 | 64.1     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BY H77 | 608,285 | 708,227 | 67.1     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| BZ H78 | 608,198 | 708,088 | 66.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CA H79 | 608,005 | 708,038 | 67.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CB H80 | 607,662 | 707,913 | 68.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CC H81 | 607,865 | 709,036 | 53.2     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CD H82 | 607,751 | 708,884 | 55.9     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CE H83 | 607,490 | 709,143 | 59.5     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CF H84 | 607,310 | 709,373 | 55.7     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CG H85 | 607,027 | 709,054 | 55.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CH H86 | 606,680 | 708,508 | 58.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CI H87 | 606,657 | 708,968 | 52.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CJ H88 | 606,500 | 708,943 | 59.8     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |
| CK H89 | 606,051 | 708,521 | 56.3     | 1.5 | 1.5   | 1.5    | 0.5                 | 90.0               | "Green house mode" | 2.0                        |

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**SHADOW - Main Result****Calculation:** Cush - GE158

...continued from previous page

| No.     | Name    | 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]                        |
| CL H90  | 606,024 | 708,520 | 56.4     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CM H91  | 605,909 | 708,570 | 54.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CN H92  | 605,851 | 708,477 | 52.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CO H93  | 605,608 | 708,265 | 47.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CP H94  | 605,525 | 708,100 | 46.6     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CQ H95  | 605,497 | 708,087 | 46.2     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CR H96  | 605,482 | 708,080 | 45.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CS H97  | 605,473 | 708,043 | 45.0     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CT H98  | 605,197 | 708,689 | 48.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CU H99  | 605,962 | 709,085 | 59.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CV H100 | 605,189 | 709,640 | 51.3     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CW H101 | 605,060 | 709,718 | 50.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CX H102 | 605,034 | 709,921 | 48.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CY H103 | 604,999 | 709,941 | 48.9     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| CZ H104 | 604,907 | 709,932 | 50.1     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DA H105 | 604,855 | 709,831 | 49.5     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DB H106 | 607,073 | 708,957 | 54.8     | 1.5 | 1.5   | 0.5    | 90.0                | "Green house mode" |                | 2.0                        |
| DC H107 | 608,313 | 713,012 | 58.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DD H108 | 609,726 | 711,851 | 64.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DE H109 | 609,792 | 711,845 | 64.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DF H110 | 610,079 | 711,939 | 58.5     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DG H111 | 610,012 | 711,725 | 61.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DH H112 | 610,164 | 711,708 | 63.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DI H113 | 610,193 | 711,561 | 70.0     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DJ H114 | 610,262 | 711,519 | 71.5     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DK H115 | 610,347 | 711,661 | 74.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DL H116 | 610,755 | 711,406 | 75.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DM H117 | 610,752 | 711,516 | 79.9     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DN H118 | 610,821 | 711,492 | 79.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DO H119 | 610,858 | 711,474 | 77.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DP H120 | 610,870 | 711,435 | 74.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DQ H121 | 610,894 | 711,417 | 71.7     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DR H122 | 610,919 | 711,381 | 68.8     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DS H123 | 610,707 | 711,093 | 72.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DT H124 | 610,693 | 711,056 | 72.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DU H125 | 610,580 | 710,824 | 69.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DV H126 | 610,689 | 710,922 | 72.2     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DW H127 | 610,504 | 710,833 | 72.1     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DX H128 | 610,445 | 710,905 | 73.0     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DY H129 | 609,178 | 711,885 | 63.9     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| DZ H130 | 607,835 | 708,810 | 61.4     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |
| EA H131 | 607,797 | 708,599 | 56.6     | 1.5 | 1.5   | 1.0    | 90.0                | "Green house mode" |                | 2.5                        |

**Calculation Results**

Shadow receptor

| No.   | Name | Shadow, worst case                   |                                        | Shadow, expected values                |                                      |
|-------|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|
|       |      | 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] | Shadow hours<br>per year<br>[h/year] |
| A H1  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| B H2  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| C H3  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| D H4  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| E H5  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| F H6  |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| 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 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| M H13 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| N H14 |      | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |

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**SHADOW - Main Result****Calculation:** Cush - GE158

...continued from previous page

| No. | Name   | Shadow, worst case                   |                                        | Max shadow<br>hours per day<br>[h/day] | Shadow, expected values              |  |
|-----|--------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|--|
|     |        | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] |                                        | Shadow hours<br>per year<br>[h/year] |  |
|     | O H15  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | P H16  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | Q H17  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | R H18  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | S H19  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | T H20  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | U H21  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | V H22  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | W H23  | 7:15                                 | 29                                     | 0:23                                   | 1:01                                 |  |
|     | X H24  | 11:39                                | 36                                     | 0:29                                   | 1:35                                 |  |
|     | Y H25  | 12:26                                | 42                                     | 0:27                                   | 1:32                                 |  |
|     | Z H26  | 24:39                                | 81                                     | 0:30                                   | 2:52                                 |  |
|     | AA H27 | 24:22                                | 84                                     | 0:31                                   | 2:52                                 |  |
|     | AB H28 | 22:21                                | 66                                     | 0:32                                   | 2:43                                 |  |
|     | AC H29 | 33:01                                | 79                                     | 0:33                                   | 3:44                                 |  |
|     | AD H30 | 36:14                                | 76                                     | 0:34                                   | 4:02                                 |  |
|     | AE H31 | 75:52                                | 137                                    | 0:53                                   | 9:05                                 |  |
|     | AF H32 | 35:25                                | 70                                     | 0:35                                   | 3:51                                 |  |
|     | AG H33 | 36:28                                | 68                                     | 0:37                                   | 3:57                                 |  |
|     | AH H34 | 33:48                                | 62                                     | 0:40                                   | 3:35                                 |  |
|     | AI H35 | 30:27                                | 56                                     | 0:39                                   | 3:14                                 |  |
|     | AJ H36 | 61:56                                | 72                                     | 1:18                                   | 6:56                                 |  |
|     | AK H37 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AL H38 | 3:01                                 | 17                                     | 0:13                                   | 0:18                                 |  |
|     | AM H39 | 12:08                                | 34                                     | 0:28                                   | 1:16                                 |  |
|     | AN H40 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AO H41 | 3:11                                 | 17                                     | 0:14                                   | 0:19                                 |  |
|     | AP H42 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AQ H43 | 12:04                                | 32                                     | 0:34                                   | 1:23                                 |  |
|     | AR H44 | 36:30                                | 70                                     | 0:35                                   | 4:34                                 |  |
|     | AS H45 | 31:02                                | 76                                     | 0:32                                   | 3:58                                 |  |
|     | AT H46 | 34:59                                | 93                                     | 0:34                                   | 4:30                                 |  |
|     | AU H47 | 75:19                                | 122                                    | 0:47                                   | 10:01                                |  |
|     | AV H48 | 8:16                                 | 33                                     | 0:23                                   | 1:24                                 |  |
|     | AW H49 | 19:37                                | 73                                     | 0:28                                   | 3:22                                 |  |
|     | AX H50 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | AY H51 | 35:49                                | 106                                    | 0:29                                   | 5:41                                 |  |
|     | AZ H52 | 34:30                                | 106                                    | 0:32                                   | 5:49                                 |  |
|     | BA H53 | 25:12                                | 90                                     | 0:28                                   | 3:58                                 |  |
|     | BB H54 | 45:49                                | 81                                     | 0:55                                   | 7:51                                 |  |
|     | BC H55 | 74:33                                | 92                                     | 1:04                                   | 11:48                                |  |
|     | BD H56 | 44:28                                | 72                                     | 0:51                                   | 6:50                                 |  |
|     | BE H57 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BF H58 | 20:36                                | 56                                     | 0:31                                   | 3:05                                 |  |
|     | BG H59 | 9:48                                 | 39                                     | 0:24                                   | 1:41                                 |  |
|     | BH H60 | 11:42                                | 45                                     | 0:24                                   | 1:59                                 |  |
|     | BI H61 | 12:23                                | 48                                     | 0:24                                   | 2:06                                 |  |
|     | BJ H62 | 21:19                                | 76                                     | 0:25                                   | 3:21                                 |  |
|     | BK H63 | 23:27                                | 72                                     | 0:26                                   | 3:38                                 |  |
|     | BL H64 | 17:50                                | 58                                     | 0:27                                   | 2:40                                 |  |
|     | BM H65 | 14:06                                | 54                                     | 0:23                                   | 2:06                                 |  |
|     | BN H66 | 8:46                                 | 45                                     | 0:17                                   | 1:18                                 |  |
|     | BO H67 | 15:15                                | 56                                     | 0:23                                   | 2:17                                 |  |
|     | BP H68 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BQ H69 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BR H70 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BS H71 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BT H72 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BU H73 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BV H74 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BW H75 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BX H76 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |
|     | BY H77 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |  |

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**SHADOW - Main Result****Calculation:** Cush - GE158

...continued from previous page

| No. | Name | Shadow, worst case                   |                                        | Max shadow<br>hours per day<br>[h/day] | Shadow, expected values              |
|-----|------|--------------------------------------|----------------------------------------|----------------------------------------|--------------------------------------|
|     |      | Shadow hours<br>per year<br>[h/year] | Shadow days<br>per year<br>[days/year] |                                        | Shadow hours<br>per year<br>[h/year] |
| BZ  | H78  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CA  | H79  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CB  | H80  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CC  | H81  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CD  | H82  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CE  | H83  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CF  | H84  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CG  | H85  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CH  | H86  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CI  | H87  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CJ  | H88  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CK  | H89  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CL  | H90  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CM  | H91  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CN  | H92  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CO  | H93  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CP  | H94  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CQ  | H95  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CR  | H96  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CS  | H97  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CT  | H98  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CU  | H99  | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CV  | H100 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CW  | H101 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CX  | H102 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CY  | H103 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| CZ  | H104 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DA  | H105 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DB  | H106 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DC  | H107 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DD  | H108 | 34:00                                | 94                                     | 0:36                                   | 4:36                                 |
| DE  | H109 | 23:48                                | 64                                     | 0:34                                   | 3:20                                 |
| DF  | H110 | 12:08                                | 41                                     | 0:27                                   | 1:42                                 |
| DG  | H111 | 14:07                                | 42                                     | 0:31                                   | 2:03                                 |
| DH  | H112 | 10:14                                | 35                                     | 0:27                                   | 1:30                                 |
| DI  | H113 | 9:29                                 | 33                                     | 0:27                                   | 1:25                                 |
| DJ  | H114 | 8:18                                 | 31                                     | 0:25                                   | 1:14                                 |
| DK  | H115 | 6:27                                 | 28                                     | 0:22                                   | 0:56                                 |
| DL  | H116 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DM  | H117 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DN  | H118 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DO  | H119 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DP  | H120 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DQ  | H121 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DR  | H122 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DS  | H123 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DT  | H124 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DU  | H125 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DV  | H126 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DW  | H127 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| DX  | H128 | 6:22                                 | 29                                     | 0:21                                   | 1:05                                 |
| DY  | H129 | 34:14                                | 88                                     | 0:31                                   | 4:27                                 |
| DZ  | H130 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |
| EA  | H131 | 0:00                                 | 0                                      | 0:00                                   | 0:00                                 |

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

| No. | Name | Worst case<br>[h/year] | Expected<br>[h/year] |
|-----|------|------------------------|----------------------|
| 1   | T9   | 187:38                 | 27:47                |
| 2   | T10  | 243:46                 | 32:00                |
| 3   | T11  | 345:03                 | 45:55                |

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.

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