

Gate Burton Energy Park Environmental Statement

Volume 3, Appendix 15-D: Glint and Glare Assessment Part 2
Document Reference: EN010131/APP/3.3
January 2023

APFP Regulation 5(2)(a)
Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

ANNEX L: AVIATION RECEPTOR GLARE RESULTS 5 DEGREES



Gate Burton Solar Farm

Gate Burton Solar Farm Aviation 5 Deg

Created Oct. 11, 2022
Updated Jan. 16, 2023
Time-step 1 minute
Timezone offset UTC0
Site ID 77373.13697

Project type Advanced
Project status: active
Category 100 MW to 1 GW



Misc. Analysis Settings

DNI: varies (1,000.0 W/m² peak)
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad

PV Analysis Methodology: **Version 2**
 Enhanced subtended angle calculation: **On**

Summary of Results Glare with low potential for temporary after-image predicted

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	5.0	180.0	1,875	0	-
PV array 2	5.0	180.0	1,457	0	-
PV array 3	5.0	180.0	1,510	0	-
PV array 4	5.0	180.0	306	0	-

Component Data

PV Array(s)

Total PV footprint area: 5,127,937 m²

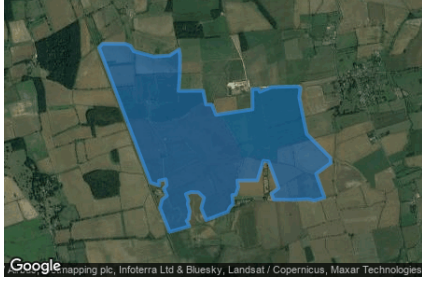
Name: PV array 1
Footprint area: 1,560,556 m²
Axis tracking: Fixed (no rotation)
Tilt: 5.0 deg
Orientation: 180.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.360166	-0.740853	25.42	3.50	28.92
2	53.359091	-0.745274	26.80	3.50	30.30
3	53.355377	-0.742828	26.70	3.50	30.20
4	53.356529	-0.739394	24.84	3.50	28.34
5	53.356350	-0.737935	25.02	3.50	28.52
6	53.356017	-0.737935	25.83	3.50	29.33
7	53.352405	-0.737678	28.89	3.50	32.39
8	53.348922	-0.739051	30.30	3.50	33.80
9	53.348998	-0.740381	32.19	3.50	35.69
10	53.349716	-0.742356	34.32	3.50	37.82
11	53.350254	-0.744973	33.12	3.50	36.62
12	53.348947	-0.744115	34.39	3.50	37.89
13	53.346505	-0.743986	28.19	3.50	31.69
14	53.346454	-0.745360	28.69	3.50	32.19
15	53.344558	-0.744673	24.65	3.50	28.15
16	53.344430	-0.745274	24.66	3.50	28.16
17	53.341150	-0.743128	25.32	3.50	28.82
18	53.340176	-0.741197	27.61	3.50	31.11
19	53.340843	-0.738193	28.84	3.50	32.34
20	53.339843	-0.737463	29.68	3.50	33.18
21	53.340484	-0.734588	28.65	3.50	32.15
22	53.340228	-0.730897	23.20	3.50	26.70
23	53.338588	-0.730339	21.49	3.50	24.99
24	53.337563	-0.730748	21.70	3.50	25.20
25	53.336922	-0.735211	27.56	3.50	31.06
26	53.334923	-0.734867	26.53	3.50	30.03
27	53.334744	-0.736498	27.74	3.50	31.24
28	53.333770	-0.737142	27.51	3.50	31.01
29	53.333514	-0.739459	30.00	3.50	33.50
30	53.332668	-0.739288	29.33	3.50	32.83
31	53.332745	-0.736756	26.57	3.50	30.07
32	53.332860	-0.733752	26.76	3.50	30.26
33	53.333949	-0.734009	26.79	3.50	30.29
34	53.334103	-0.731649	23.67	3.50	27.17
35	53.332924	-0.731391	24.58	3.50	28.08
36	53.333104	-0.727958	16.26	3.50	19.76
37	53.332847	-0.726242	15.74	3.50	19.24
38	53.333744	-0.725169	15.12	3.50	18.62
39	53.332745	-0.724053	18.66	3.50	22.16
40	53.333206	-0.722293	17.57	3.50	21.07
41	53.343020	-0.728473	22.60	3.50	26.10
42	53.342457	-0.731005	25.43	3.50	28.93
43	53.340971	-0.730576	23.23	3.50	26.73
44	53.340996	-0.731863	25.84	3.50	29.34
45	53.341278	-0.732679	25.83	3.50	29.33
46	53.344122	-0.733494	20.46	3.50	23.96
47	53.344788	-0.729632	20.02	3.50	23.52
48	53.345429	-0.730104	21.17	3.50	24.67
49	53.344891	-0.733752	23.65	3.50	27.15
50	53.345044	-0.735382	24.65	3.50	28.15
51	53.343815	-0.734953	21.26	3.50	24.76
52	53.343712	-0.735855	21.80	3.50	25.30
53	53.344968	-0.736284	23.78	3.50	27.28
54	53.344942	-0.738129	22.22	3.50	25.72
55	53.345429	-0.738472	22.95	3.50	26.45
56	53.345500	-0.736894	24.00	3.50	27.50
57	53.346679	-0.737108	22.04	3.50	25.54
58	53.347088	-0.736465	22.78	3.50	26.28
59	53.347422	-0.736465	23.26	3.50	26.76
60	53.347165	-0.731014	24.66	3.50	28.16
61	53.353570	-0.735258	23.43	3.50	26.93
62	53.354005	-0.736545	22.40	3.50	25.90
63	53.355311	-0.736502	22.00	3.50	25.50
64	53.356899	-0.737403	23.35	3.50	26.85

65	53.356566	-0.738090	24.66	3.50	28.16
66	53.356797	-0.738991	24.06	3.50	27.56

Name: PV array 2
Footprint area: 3,187,939 m²
Axis tracking: Fixed (no rotation)
Tilt: 5.0 deg
Orientation: 180.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.353754	-0.734662	23.97	3.50	27.47
2	53.338935	-0.725169	13.57	3.50	17.07
3	53.338615	-0.723559	12.00	3.50	15.50
4	53.339140	-0.723624	12.00	3.50	15.50
5	53.339294	-0.722401	12.00	3.50	15.50
6	53.338666	-0.722207	11.79	3.50	15.29
7	53.338269	-0.722744	12.00	3.50	15.50
8	53.337500	-0.722165	11.72	3.50	15.22
9	53.337064	-0.723066	12.31	3.50	15.81
10	53.336155	-0.723452	13.00	3.50	16.50
11	53.333515	-0.721671	15.87	3.50	19.37
12	53.334143	-0.718045	11.00	3.50	14.50
13	53.334745	-0.718538	11.00	3.50	14.50
14	53.334950	-0.718152	11.00	3.50	14.50
15	53.335783	-0.717959	10.14	3.50	13.64
16	53.336616	-0.718345	9.24	3.50	12.74
17	53.336975	-0.718216	9.59	3.50	13.09
18	53.337667	-0.718688	10.61	3.50	14.11
19	53.337897	-0.717723	10.95	3.50	14.45
20	53.337859	-0.716392	9.89	3.50	13.39
21	53.337269	-0.715341	9.24	3.50	12.74
22	53.336116	-0.715856	9.81	3.50	13.31
23	53.334809	-0.714955	10.90	3.50	14.40
24	53.335732	-0.710949	11.21	3.50	14.71
25	53.336244	-0.710563	11.08	3.50	14.58
26	53.336552	-0.709983	11.04	3.50	14.54
27	53.337564	-0.710155	12.22	3.50	15.72
28	53.337603	-0.709511	12.51	3.50	16.01
29	53.338410	-0.709061	13.25	3.50	16.75
30	53.339153	-0.709211	13.80	3.50	17.30
31	53.339178	-0.705520	14.81	3.50	18.31
32	53.341318	-0.704426	14.16	3.50	17.66
33	53.341254	-0.703460	15.00	3.50	18.50
34	53.338320	-0.701636	14.00	3.50	17.50
35	53.337731	-0.702967	14.70	3.50	18.20
36	53.337052	-0.702516	14.29	3.50	17.79
37	53.337039	-0.698825	16.56	3.50	20.06
38	53.337128	-0.696336	19.06	3.50	22.56
39	53.336962	-0.695049	20.32	3.50	23.82
40	53.337295	-0.693182	19.41	3.50	22.91
41	53.339883	-0.694727	14.00	3.50	17.50
42	53.341087	-0.692023	13.00	3.50	16.50
43	53.341664	-0.692109	13.00	3.50	16.50
44	53.344277	-0.696465	12.00	3.50	15.50
45	53.348287	-0.697817	13.08	3.50	16.58
46	53.349350	-0.697602	14.02	3.50	17.52
47	53.349516	-0.698224	14.00	3.50	17.50
48	53.349427	-0.702924	17.52	3.50	21.02
49	53.348914	-0.705091	17.98	3.50	21.48
50	53.349222	-0.705305	18.00	3.50	21.50
51	53.349183	-0.706464	18.00	3.50	21.50
52	53.346980	-0.706421	17.00	3.50	20.50
53	53.346378	-0.713138	13.88	3.50	17.38
54	53.347505	-0.713910	14.28	3.50	17.78
55	53.347505	-0.714983	14.25	3.50	17.75
56	53.349030	-0.715498	16.00	3.50	19.50
57	53.349004	-0.720004	22.46	3.50	25.96
58	53.350848	-0.719789	21.00	3.50	24.50
59	53.352872	-0.719747	19.04	3.50	22.54
60	53.353564	-0.719918	18.54	3.50	22.04
61	53.352898	-0.721678	18.21	3.50	21.71
62	53.352782	-0.724574	17.76	3.50	21.26
63	53.353359	-0.728244	19.54	3.50	23.04
64	53.353961	-0.728887	19.19	3.50	22.69

65	53.354166	-0.729746	19.36	3.50	22.86
66	53.354179	-0.734016	22.69	3.50	26.19

Name: PV array 3

Footprint area: 162,584 m²

Axis tracking: Fixed (no rotation)

Tilt: 5.0 deg

Orientation: 180.0 deg

Rated power: -

Panel material: Light textured glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 9.16 mrad



Vertex	Latitude deg	Longitude deg	Ground elevation m	Height above ground m	Total elevation m
1	53.355703	-0.727643	18.87	3.50	22.37
2	53.355177	-0.725669	17.24	3.50	20.74
3	53.355088	-0.721935	18.98	3.50	22.48
4	53.355101	-0.720734	21.71	3.50	25.21
5	53.356125	-0.721034	21.89	3.50	25.39
6	53.357483	-0.721120	19.10	3.50	22.60
7	53.357534	-0.722836	18.29	3.50	21.79
8	53.359083	-0.721849	18.14	3.50	21.64
9	53.359544	-0.722107	16.73	3.50	20.23
10	53.359762	-0.721485	16.64	3.50	20.14
11	53.359583	-0.720734	17.67	3.50	21.17
12	53.360402	-0.719875	17.29	3.50	20.79
13	53.360313	-0.723673	16.00	3.50	19.50
14	53.360044	-0.724832	16.19	3.50	19.69
15	53.357585	-0.725175	17.45	3.50	20.95

Name: PV array 4

Footprint area: 216,857 m²

Axis tracking: Fixed (no rotation)

Tilt: 5.0 deg

Orientation: 180.0 deg

Rated power: -

Panel material: Light textured glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 9.16 mrad



Vertex	Latitude deg	Longitude deg	Ground elevation m	Height above ground m	Total elevation m
1	53.360082	-0.727836	17.00	3.50	20.50
2	53.360851	-0.728501	17.37	3.50	20.87
3	53.360710	-0.729596	18.17	3.50	21.67
4	53.361107	-0.729660	18.75	3.50	22.25
5	53.361952	-0.729424	19.00	3.50	22.50
6	53.362874	-0.729510	19.31	3.50	22.81
7	53.363335	-0.730003	20.12	3.50	23.62
8	53.363591	-0.729209	19.64	3.50	23.14
9	53.364052	-0.725733	17.95	3.50	21.45
10	53.364410	-0.720433	15.80	3.50	19.30
11	53.362554	-0.719918	16.00	3.50	19.50
12	53.360671	-0.724210	16.71	3.50	20.21

2-Mile Flight Path Receptor(s)

Name: Gamston Airfield - Runway 03
Description:
Threshold height : 15 m
Direction: 24.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg



Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.275892	-0.955025	26.00	15.24	41.24
2-mile point	53.249666	-0.975406	28.50	181.43	209.92

Name: Gamston Airfield - Runway 14
Description:
Threshold height : 15 m
Direction: 139.7 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg



Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.282048	-0.966668	23.78	15.24	39.02
2-mile point	53.304102	-0.997976	31.17	176.54	207.71

Name: Gamston Airfield - Runway 21
Description:
Threshold height : 15 m
Direction: 204.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg



Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.285441	-0.947633	25.36	15.24	40.60
2-mile point	53.311666	-0.927247	20.81	188.48	209.29

Name: Gamston Airfield - Runway 32
Description:
Threshold height : 15 m
Direction: 319.6 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.276602	-0.959308	24.58	15.24	39.82
2-mile point	53.254594	-0.927914	25.63	182.87	208.50



Name: Sturgate Airfield - Runway 09
Description:
Threshold height : 15 m
Direction: 86.4 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.381013	-0.690067	17.00	15.24	32.24
2-mile point	53.379193	-0.738499	25.40	175.53	200.92



Name: Sturgate Airfield - Runway 27
Description:
Threshold height : 15 m
Direction: 266.5 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.381412	-0.679740	17.69	15.24	32.93
2-mile point	53.383197	-0.631304	23.25	178.36	201.61



Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
1-ATCT	53.279208	-0.950061	26.47	5.00	31.47

1-ATCT map image



Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
PV array 1	5.0	180.0	1,875	0	-	-
PV array 2	5.0	180.0	1,457	0	-	-
PV array 3	5.0	180.0	1,510	0	-	-
PV array 4	5.0	180.0	306	0	-	-

Distinct glare per month

Excludes overlapping glare from PV array for multiple receptors at matching time(s)

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pv-array-1 (green)	0	115	0	41	425	521	494	168	0	106	5	0
pv-array-1 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-2 (green)	0	21	0	28	442	328	454	161	0	15	8	0
pv-array-2 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-3 (green)	0	77	0	0	227	649	476	0	0	70	11	0
pv-array-3 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-4 (green)	0	152	0	0	0	0	0	0	0	151	3	0
pv-array-4 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0

PV & Receptor Analysis Results

Results for each PV array and receptor

PV array 1 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	226	0
OP: 1-ATCT	1649	0

PV array 1 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 1 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 1 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 1 - Receptor (Gamston Airfield - Runway 32)

No glare found

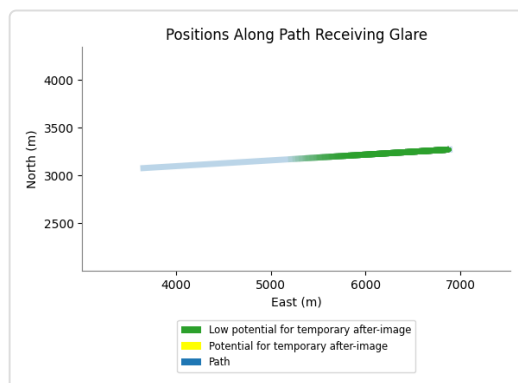
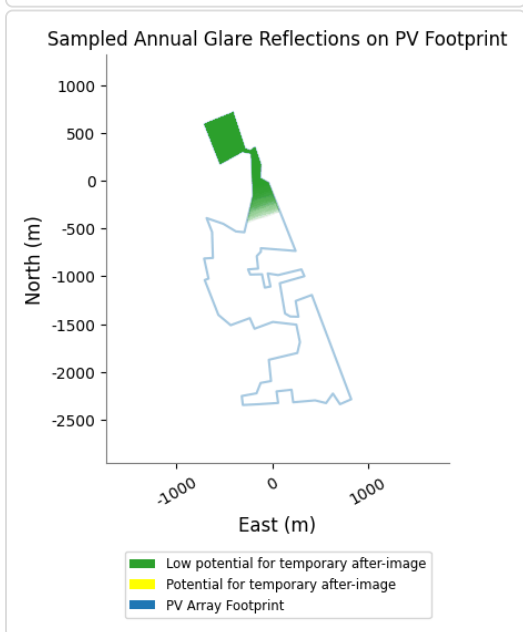
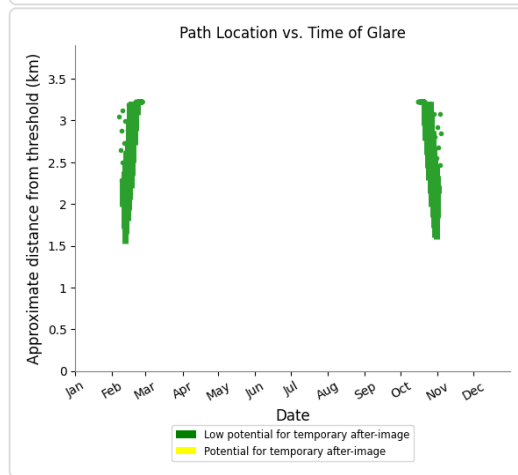
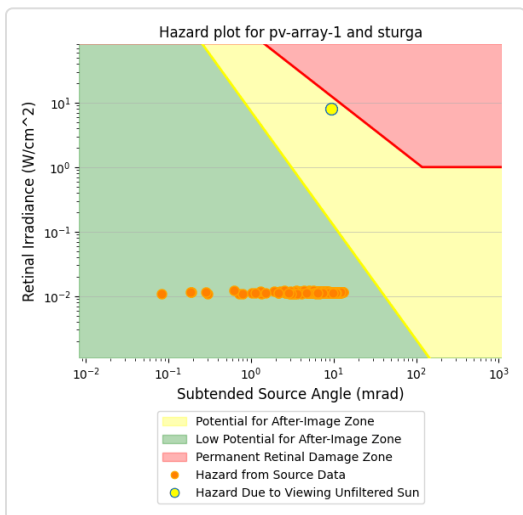
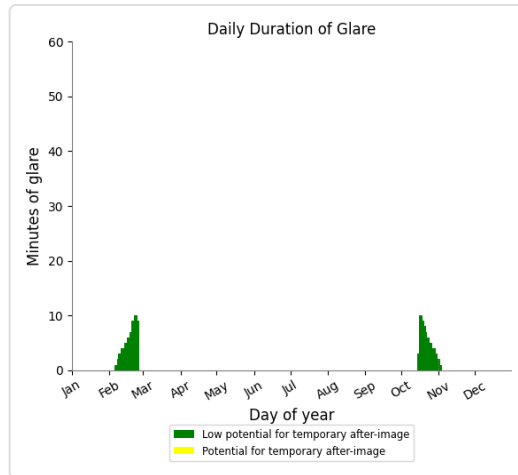
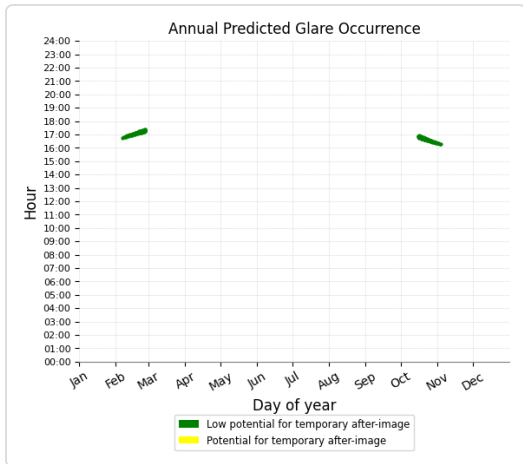
PV array 1 - Receptor (Sturgate Airfield - Runway 09)

No glare found

PV array 1 - Receptor (Sturgate Airfield - Runway 27)

PV array is expected to produce the following glare for observers on this flight path:

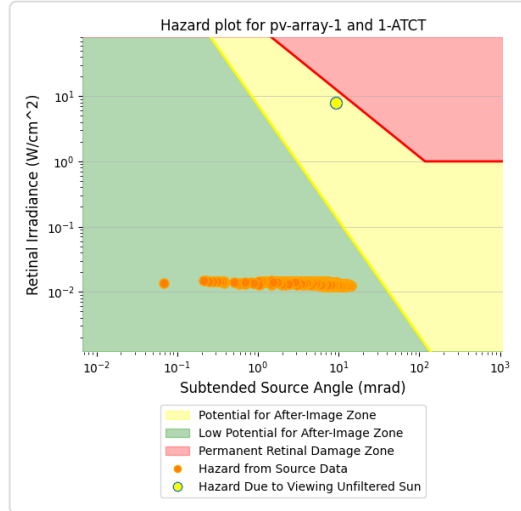
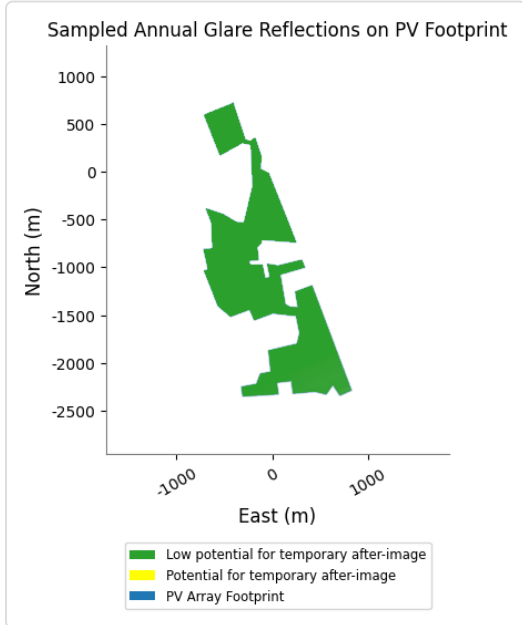
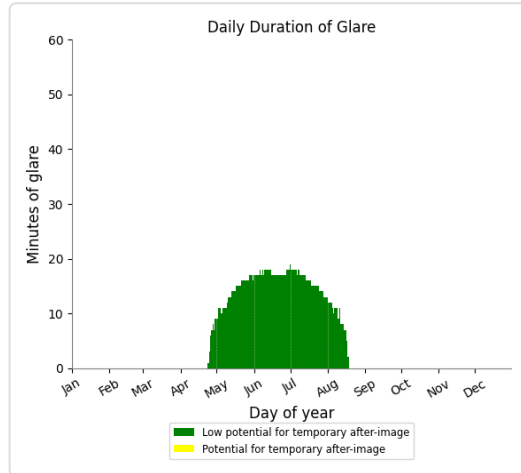
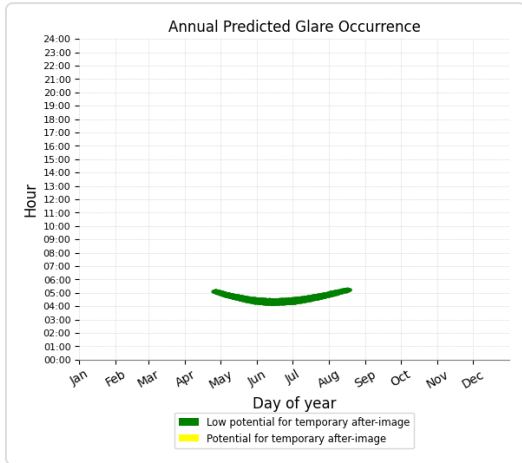
- 226 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 1 - OP Receptor (1-ATCT)

PV array is expected to produce the following glare for receptors at this location:

- 1,649 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	44	0
OP: 1-ATCT	1413	0

PV array 2 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 2 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 2 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 2 - Receptor (Gamston Airfield - Runway 32)

No glare found

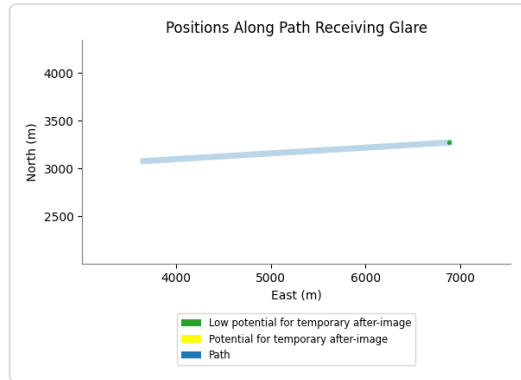
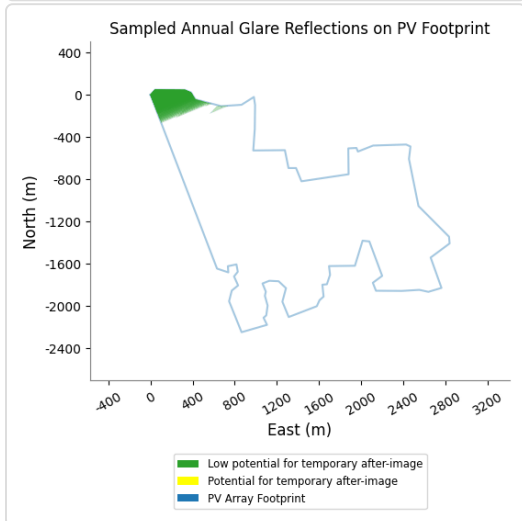
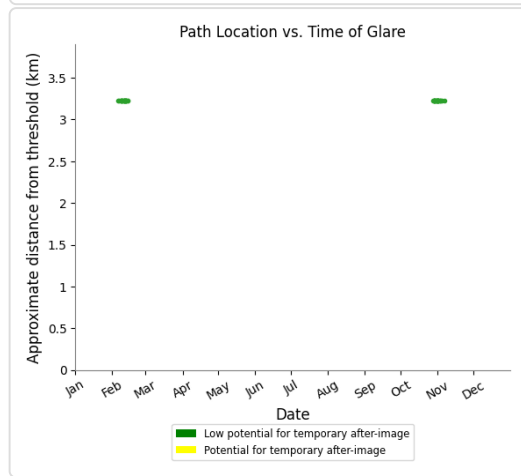
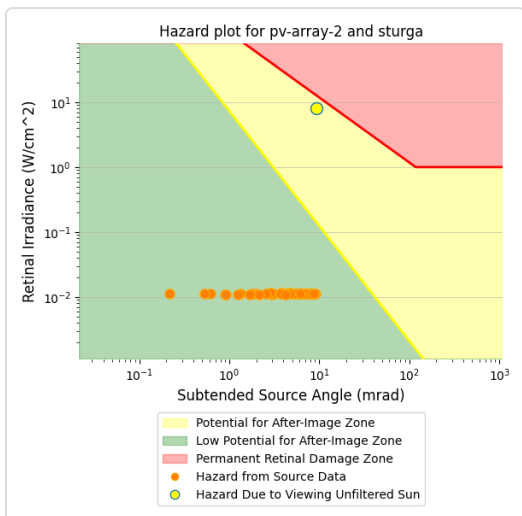
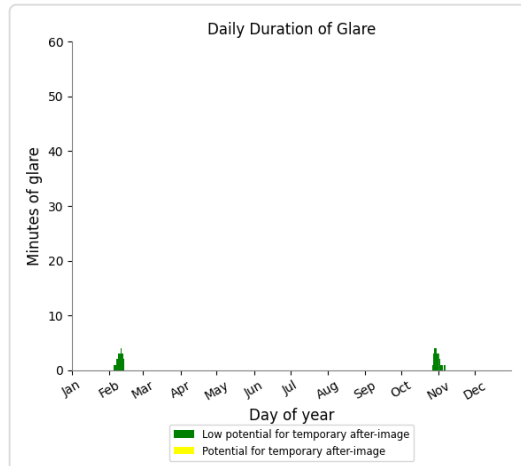
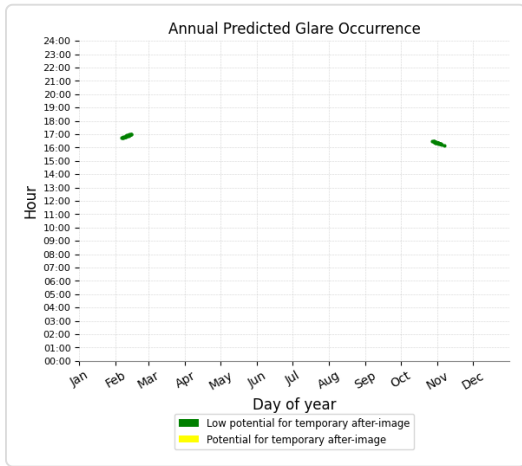
PV array 2 - Receptor (Sturgate Airfield - Runway 09)

No glare found

PV array 2 - Receptor (Sturgate Airfield - Runway 27)

PV array is expected to produce the following glare for observers on this flight path:

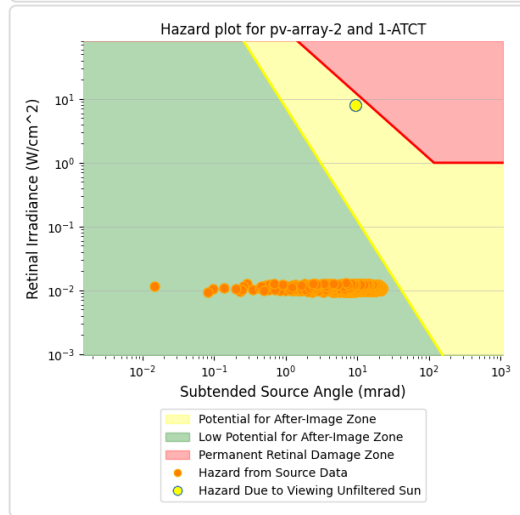
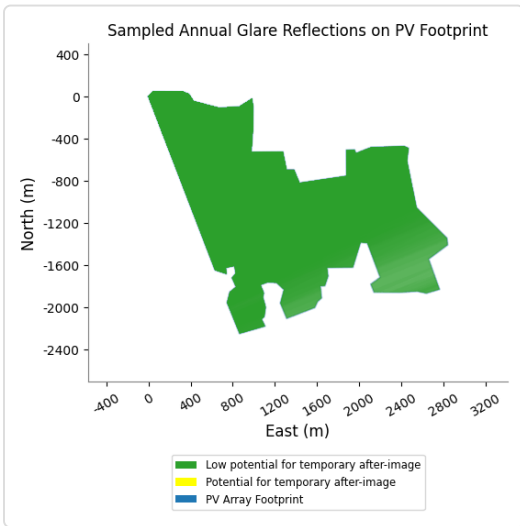
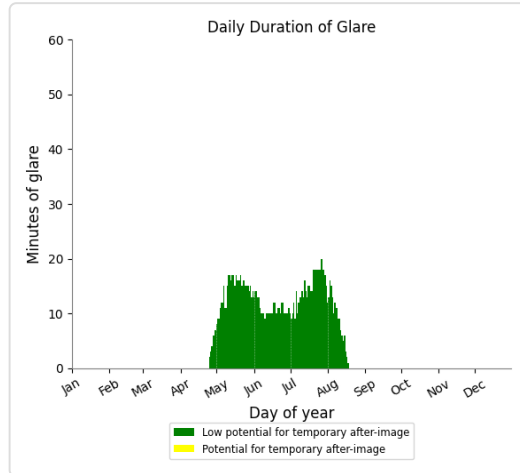
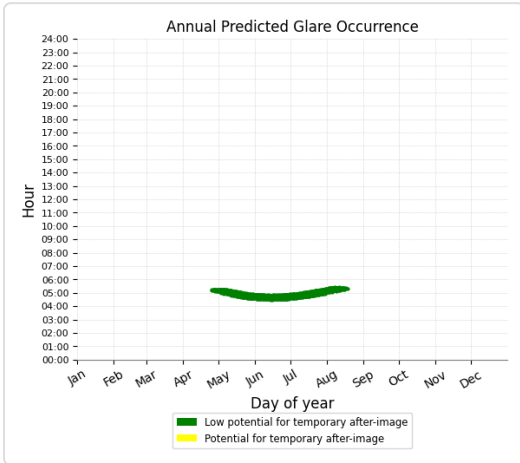
- 44 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2 - OP Receptor (1-ATCT)

PV array is expected to produce the following glare for receptors at this location:

- 1,413 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 3 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	158	0
OP: 1-ATCT	1352	0

PV array 3 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 3 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 3 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 3 - Receptor (Gamston Airfield - Runway 32)

No glare found

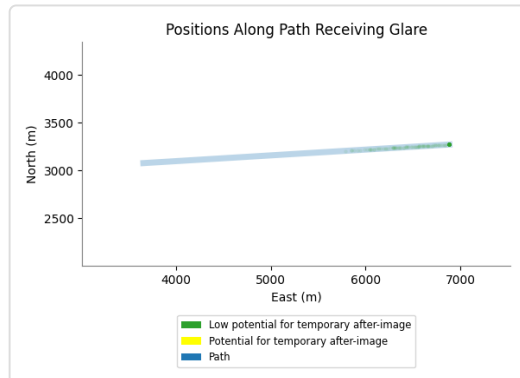
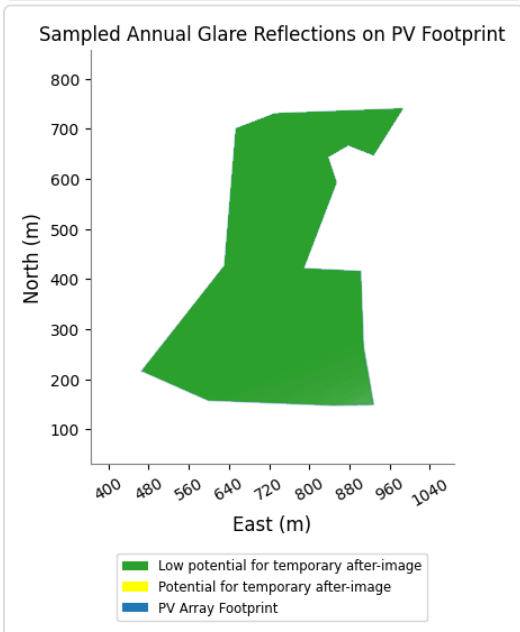
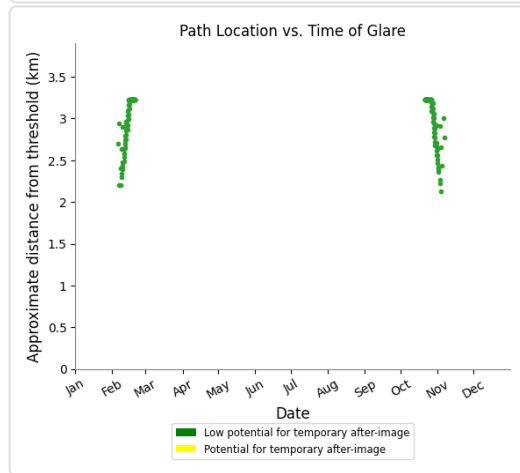
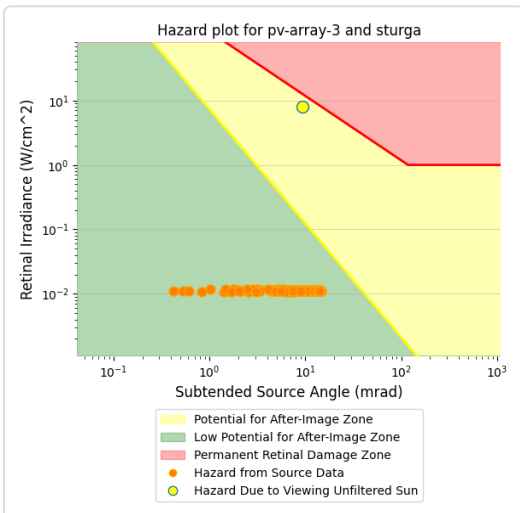
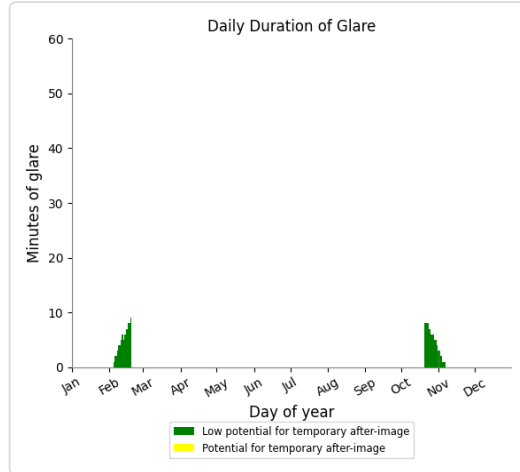
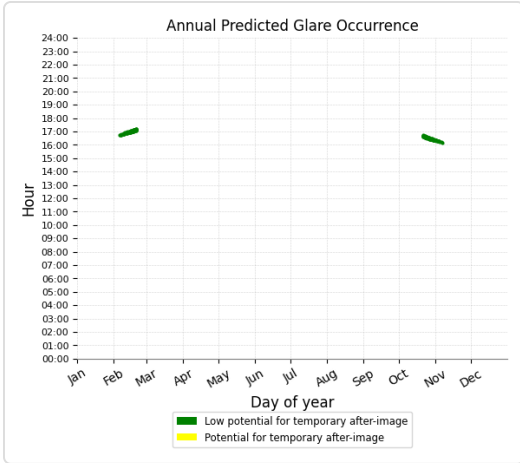
PV array 3 - Receptor (Sturgate Airfield - Runway 09)

No glare found

PV array 3 - Receptor (Sturgate Airfield - Runway 27)

PV array is expected to produce the following glare for observers on this flight path:

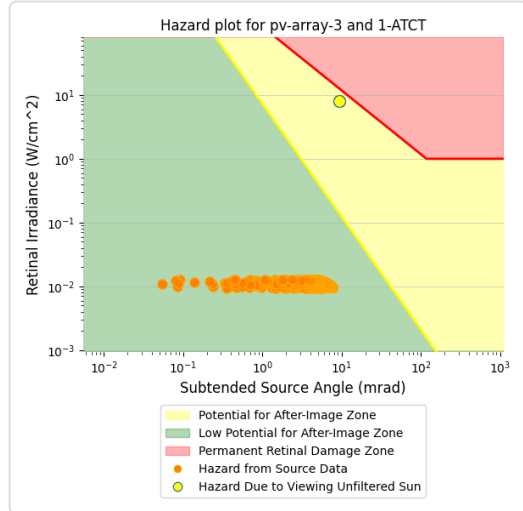
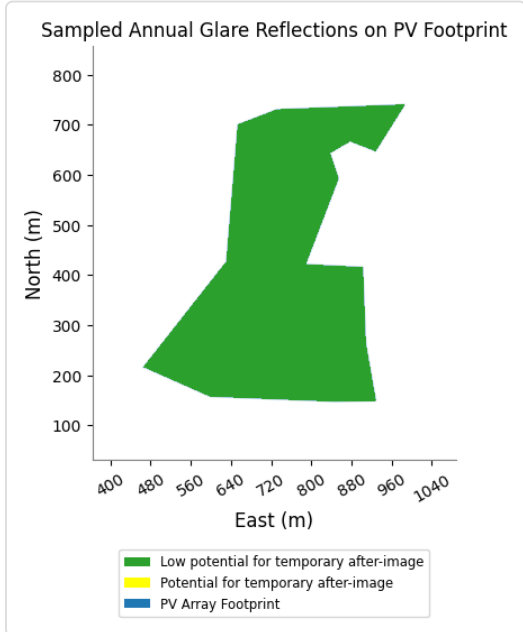
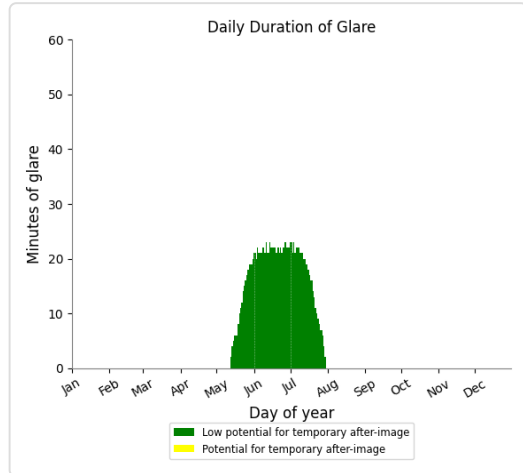
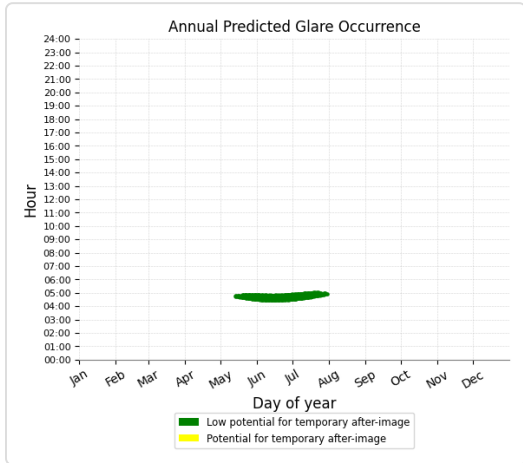
- 158 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 3 - OP Receptor (1-ATCT)

PV array is expected to produce the following glare for receptors at this location:

- 1,352 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 4 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	306	0
OP: 1-ATCT	0	0

PV array 4 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 4 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 4 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 4 - Receptor (Gamston Airfield - Runway 32)

No glare found

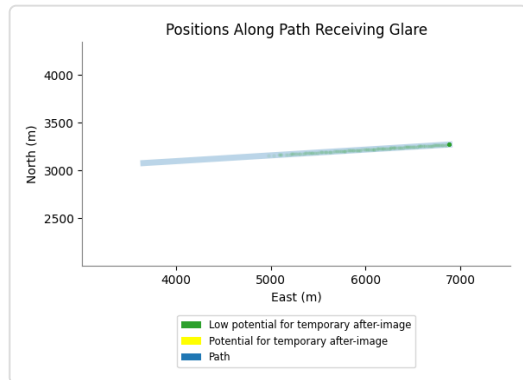
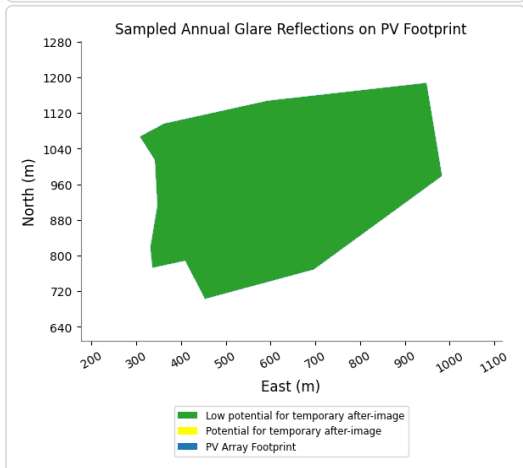
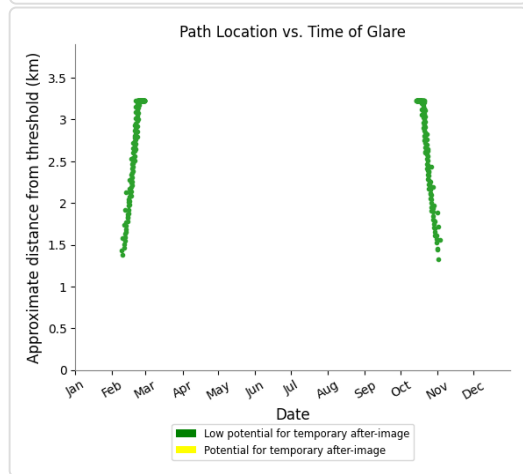
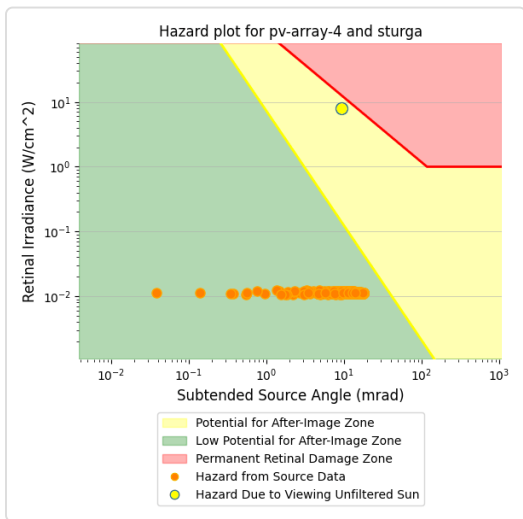
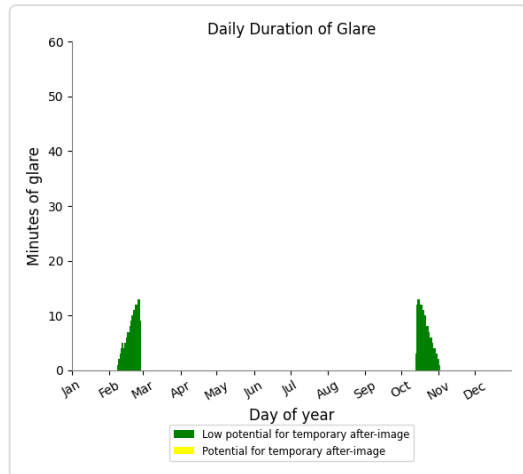
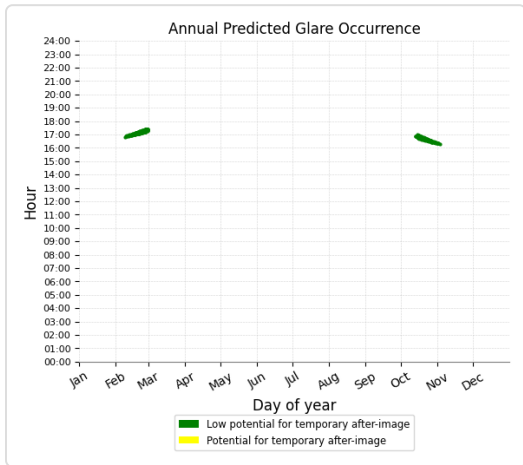
PV array 4 - Receptor (Sturgate Airfield - Runway 09)

No glare found

PV array 4 - Receptor (Sturgate Airfield - Runway 27)

PV array is expected to produce the following glare for observers on this flight path:

- 306 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 4 - OP Receptor (1-ATCT)

No glare found

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not automatically account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
- Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.

ANNEX M: AVIATION RECEPTOR GLARE RESULTS 45 DEGREES





Gate Burton Solar Farm

Gate Burton Solar Farm Aviation45 Deg

Created Jan. 16, 2023
Updated Jan. 16, 2023
Time-step 1 minute
Timezone offset UTC0
Site ID 82492.13697
Project type Advanced
Project status: active
Category 100 MW to 1 GW



Misc. Analysis Settings

DNI: varies (1,000.0 W/m² peak)
Ocular transmission coefficient: 0.5
Pupil diameter: 0.002 m
Eye focal length: 0.017 m
Sun subtended angle: 9.3 mrad

PV Analysis Methodology: Version 2
Enhanced subtended angle calculation: On

Summary of Results Glare with low potential for temporary after-image predicted

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	45.0	180.0	1,879	0	-
PV array 2	45.0	180.0	1,551	0	-
PV array 3	45.0	180.0	1,344	0	-
PV array 4	45.0	180.0	0	0	-

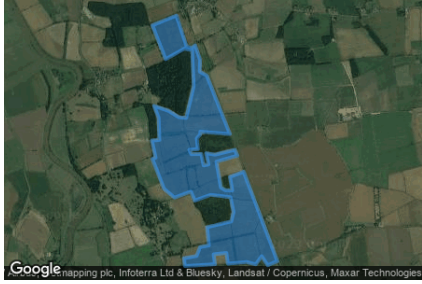
Component Data



PV Array(s)

Total PV footprint area: 5,127,165 m²

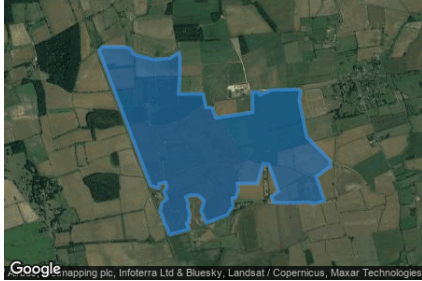
Name: PV array 1
Footprint area: 1,560,320 m²
Axis tracking: Fixed (no rotation)
Tilt: 45.0 deg
Orientation: 180.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.360166	-0.740853	25.42	3.50	28.92
2	53.359091	-0.745274	26.80	3.50	30.30
3	53.355377	-0.742828	26.70	3.50	30.20
4	53.356529	-0.739394	24.84	3.50	28.34
5	53.356350	-0.737935	25.02	3.50	28.52
6	53.356017	-0.737935	25.83	3.50	29.33
7	53.352405	-0.737678	28.89	3.50	32.39
8	53.348922	-0.739051	30.30	3.50	33.80
9	53.348998	-0.740381	32.19	3.50	35.69
10	53.349716	-0.742356	34.32	3.50	37.82
11	53.350254	-0.744973	33.12	3.50	36.62
12	53.348947	-0.744115	34.39	3.50	37.89
13	53.346505	-0.743986	28.19	3.50	31.69
14	53.346454	-0.745360	28.69	3.50	32.19
15	53.344558	-0.744673	24.65	3.50	28.15
16	53.344430	-0.745274	24.66	3.50	28.16
17	53.341150	-0.743128	25.32	3.50	28.82
18	53.340176	-0.741197	27.61	3.50	31.11
19	53.340843	-0.738193	28.84	3.50	32.34
20	53.339843	-0.737463	29.68	3.50	33.18
21	53.340484	-0.734588	28.65	3.50	32.15
22	53.340228	-0.730897	23.20	3.50	26.70
23	53.338588	-0.730339	21.49	3.50	24.99
24	53.337563	-0.730748	21.70	3.50	25.20
25	53.336922	-0.735211	27.56	3.50	31.06
26	53.334923	-0.734867	26.53	3.50	30.03
27	53.334744	-0.736498	27.74	3.50	31.24
28	53.333770	-0.737142	27.51	3.50	31.01
29	53.333514	-0.739459	30.00	3.50	33.50
30	53.332668	-0.739288	29.33	3.50	32.83
31	53.332745	-0.736756	26.57	3.50	30.07
32	53.332860	-0.733752	26.76	3.50	30.26
33	53.333949	-0.734009	26.79	3.50	30.29
34	53.334103	-0.731649	23.67	3.50	27.17
35	53.332924	-0.731391	24.58	3.50	28.08
36	53.333104	-0.727958	16.26	3.50	19.76
37	53.332847	-0.726242	15.74	3.50	19.24
38	53.333744	-0.725169	15.12	3.50	18.62
39	53.332745	-0.724053	18.66	3.50	22.16
40	53.333206	-0.722293	17.57	3.50	21.07
41	53.343020	-0.728473	22.60	3.50	26.10
42	53.342457	-0.731005	25.43	3.50	28.93
43	53.340971	-0.730576	23.23	3.50	26.73
44	53.340996	-0.731863	25.84	3.50	29.34
45	53.341278	-0.732679	25.83	3.50	29.33
46	53.344122	-0.733494	20.46	3.50	23.96
47	53.344788	-0.729632	20.02	3.50	23.52
48	53.345429	-0.730104	21.17	3.50	24.67
49	53.344891	-0.733752	23.65	3.50	27.15
50	53.345044	-0.735382	24.65	3.50	28.15
51	53.343815	-0.734953	21.26	3.50	24.76
52	53.343712	-0.735855	21.80	3.50	25.30
53	53.344968	-0.736284	23.78	3.50	27.28
54	53.344942	-0.738129	22.22	3.50	25.72
55	53.345429	-0.738472	22.95	3.50	26.45
56	53.345500	-0.736894	24.00	3.50	27.50
57	53.346679	-0.737108	22.04	3.50	25.54
58	53.347088	-0.736465	22.78	3.50	26.28
59	53.347422	-0.736465	23.26	3.50	26.76
60	53.347165	-0.731014	24.66	3.50	28.16
61	53.353570	-0.735258	23.43	3.50	26.93
62	53.354005	-0.736545	22.40	3.50	25.90
63	53.355311	-0.736502	22.00	3.50	25.50
64	53.356899	-0.737403	23.35	3.50	26.85

65	53.356566	-0.738090	24.66	3.50	28.16
66	53.356797	-0.738991	24.06	3.50	27.56

Name: PV array 2
Footprint area: 3,187,461 m²
Axis tracking: Fixed (no rotation)
Tilt: 45.0 deg
Orientation: 180.0 deg
Rated power: -
Panel material: Light textured glass with AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 9.16 mrad



Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
1	53.353754	-0.734662	23.97	3.50	27.47
2	53.338935	-0.725169	13.57	3.50	17.07
3	53.338615	-0.723559	12.00	3.50	15.50
4	53.339140	-0.723624	12.00	3.50	15.50
5	53.339294	-0.722401	12.00	3.50	15.50
6	53.338666	-0.722207	11.79	3.50	15.29
7	53.338269	-0.722744	12.00	3.50	15.50
8	53.337500	-0.722165	11.72	3.50	15.22
9	53.337064	-0.723066	12.31	3.50	15.81
10	53.336155	-0.723452	13.00	3.50	16.50
11	53.333515	-0.721671	15.87	3.50	19.37
12	53.334143	-0.718045	11.00	3.50	14.50
13	53.334745	-0.718538	11.00	3.50	14.50
14	53.334950	-0.718152	11.00	3.50	14.50
15	53.335783	-0.717959	10.14	3.50	13.64
16	53.336616	-0.718345	9.24	3.50	12.74
17	53.336975	-0.718216	9.59	3.50	13.09
18	53.337667	-0.718688	10.61	3.50	14.11
19	53.337897	-0.717723	10.95	3.50	14.45
20	53.337859	-0.716392	9.89	3.50	13.39
21	53.337269	-0.715341	9.24	3.50	12.74
22	53.336116	-0.715856	9.81	3.50	13.31
23	53.334809	-0.714955	10.90	3.50	14.40
24	53.335732	-0.710949	11.21	3.50	14.71
25	53.336244	-0.710563	11.08	3.50	14.58
26	53.336552	-0.709983	11.04	3.50	14.54
27	53.337564	-0.710155	12.22	3.50	15.72
28	53.337603	-0.709511	12.51	3.50	16.01
29	53.338410	-0.709061	13.25	3.50	16.75
30	53.339153	-0.709211	13.80	3.50	17.30
31	53.339178	-0.705520	14.81	3.50	18.31
32	53.341318	-0.704426	14.16	3.50	17.66
33	53.341254	-0.703460	15.00	3.50	18.50
34	53.338320	-0.701636	14.00	3.50	17.50
35	53.337731	-0.702967	14.70	3.50	18.20
36	53.337052	-0.702516	14.29	3.50	17.79
37	53.337039	-0.698825	16.56	3.50	20.06
38	53.337128	-0.696336	19.06	3.50	22.56
39	53.336962	-0.695049	20.32	3.50	23.82
40	53.337295	-0.693182	19.41	3.50	22.91
41	53.339883	-0.694727	14.00	3.50	17.50
42	53.341087	-0.692023	13.00	3.50	16.50
43	53.341664	-0.692109	13.00	3.50	16.50
44	53.344277	-0.696465	12.00	3.50	15.50
45	53.348287	-0.697817	13.08	3.50	16.58
46	53.349350	-0.697602	14.02	3.50	17.52
47	53.349516	-0.698224	14.00	3.50	17.50
48	53.349427	-0.702924	17.52	3.50	21.02
49	53.348914	-0.705091	17.98	3.50	21.48
50	53.349222	-0.705305	18.00	3.50	21.50
51	53.349183	-0.706464	18.00	3.50	21.50
52	53.346980	-0.706421	17.00	3.50	20.50
53	53.346378	-0.713138	13.88	3.50	17.38
54	53.347505	-0.713910	14.28	3.50	17.78
55	53.347505	-0.714983	14.25	3.50	17.75
56	53.349030	-0.715498	16.00	3.50	19.50
57	53.349004	-0.720004	22.46	3.50	25.96
58	53.350848	-0.719789	21.00	3.50	24.50
59	53.352872	-0.719747	19.04	3.50	22.54
60	53.353564	-0.719918	18.54	3.50	22.04
61	53.352898	-0.721678	18.21	3.50	21.71
62	53.352782	-0.724574	17.76	3.50	21.26
63	53.353359	-0.728244	19.54	3.50	23.04
64	53.353961	-0.728887	19.19	3.50	22.69

65	53.354166	-0.729746	19.36	3.50	22.86
66	53.354179	-0.734016	22.69	3.50	26.19

Name: PV array 3

Footprint area: 162,560 m²

Axis tracking: Fixed (no rotation)

Tilt: 45.0 deg

Orientation: 180.0 deg

Rated power: -

Panel material: Light textured glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 9.16 mrad



Vertex	Latitude deg	Longitude deg	Ground elevation m	Height above ground m	Total elevation m
1	53.355703	-0.727643	18.87	3.50	22.37
2	53.355177	-0.725669	17.24	3.50	20.74
3	53.355088	-0.721935	18.98	3.50	22.48
4	53.355101	-0.720734	21.71	3.50	25.21
5	53.356125	-0.721034	21.89	3.50	25.39
6	53.357483	-0.721120	19.10	3.50	22.60
7	53.357534	-0.722836	18.29	3.50	21.79
8	53.359083	-0.721849	18.14	3.50	21.64
9	53.359544	-0.722107	16.73	3.50	20.23
10	53.359762	-0.721485	16.64	3.50	20.14
11	53.359583	-0.720734	17.67	3.50	21.17
12	53.360402	-0.719875	17.29	3.50	20.79
13	53.360313	-0.723673	16.00	3.50	19.50
14	53.360044	-0.724832	16.19	3.50	19.69
15	53.357585	-0.725175	17.45	3.50	20.95

Name: PV array 4

Footprint area: 216,825 m²

Axis tracking: Fixed (no rotation)

Tilt: 45.0 deg

Orientation: 180.0 deg

Rated power: -

Panel material: Light textured glass with AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 9.16 mrad



Vertex	Latitude deg	Longitude deg	Ground elevation m	Height above ground m	Total elevation m
1	53.360082	-0.727836	17.00	3.50	20.50
2	53.360851	-0.728501	17.37	3.50	20.87
3	53.360710	-0.729596	18.17	3.50	21.67
4	53.361107	-0.729660	18.75	3.50	22.25
5	53.361952	-0.729424	19.00	3.50	22.50
6	53.362874	-0.729510	19.31	3.50	22.81
7	53.363335	-0.730003	20.12	3.50	23.62
8	53.363591	-0.729209	19.64	3.50	23.14
9	53.364052	-0.725733	17.95	3.50	21.45
10	53.364410	-0.720433	15.80	3.50	19.30
11	53.362554	-0.719918	16.00	3.50	19.50
12	53.360671	-0.724210	16.71	3.50	20.21

2-Mile Flight Path Receptor(s)

Name: Gamston Airfield - Runway 03
Description:
Threshold height : 15 m
Direction: 24.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.275892	-0.955025	26.00	15.24	41.24
2-mile point	53.249666	-0.975406	28.50	181.43	209.92



Name: Gamston Airfield - Runway 14
Description:
Threshold height : 15 m
Direction: 139.7 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.282048	-0.966668	23.78	15.24	39.02
2-mile point	53.304102	-0.997976	31.17	176.54	207.71



Name: Gamston Airfield - Runway 21
Description:
Threshold height : 15 m
Direction: 204.9 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.285441	-0.947633	25.36	15.24	40.60
2-mile point	53.311666	-0.927247	20.81	188.48	209.29



Name: Gamston Airfield - Runway 32
Description:
Threshold height : 15 m
Direction: 319.6 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg



Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.276602	-0.959308	24.58	15.24	39.82
2-mile point	53.254594	-0.927914	25.63	182.87	208.50

Name: Sturgate Airfield - Runway 09
Description:
Threshold height : 15 m
Direction: 86.4 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg



Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.381013	-0.690067	17.00	15.24	32.24
2-mile point	53.379193	-0.738499	25.40	175.53	200.92

Name: Sturgate Airfield - Runway 27
Description:
Threshold height : 15 m
Direction: 266.5 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 25.0 deg



Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	m	m	m
Threshold	53.381412	-0.679740	17.69	15.24	32.93
2-mile point	53.383197	-0.631304	23.25	178.36	201.61

Discrete Observation Receptors

Number	Latitude	Longitude	Ground elevation	Height above ground	Total Elevation
	deg	deg	m	m	m
1-ATCT	53.279208	-0.950061	26.47	5.00	31.47

1-ATCT map image



Summary of PV Glare Analysis

PV configuration and total predicted glare

PV Name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced	Data File
	deg	deg	min	min	kWh	
PV array 1	45.0	180.0	1,879	0	-	-
PV array 2	45.0	180.0	1,551	0	-	-
PV array 3	45.0	180.0	1,344	0	-	-
PV array 4	45.0	180.0	0	0	-	-

Distinct glare per month

Excludes overlapping glare from PV array for multiple receptors at matching time(s)

PV	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
pv-array-1 (green)	0	0	0	1	520	601	615	142	0	0	0	0
pv-array-1 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-2 (green)	0	0	0	52	485	333	479	202	0	0	0	0
pv-array-2 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0
pv-array-3 (green)	0	0	0	0	248	609	487	0	0	0	0	0
pv-array-3 (yellow)	0	0	0	0	0	0	0	0	0	0	0	0

PV & Receptor Analysis Results

Results for each PV array and receptor

PV array 1 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	0	0
OP: 1-ATCT	1879	0

PV array 1 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 1 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 1 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 1 - Receptor (Gamston Airfield - Runway 32)

No glare found

PV array 1 - Receptor (Sturgate Airfield - Runway 09)

No glare found

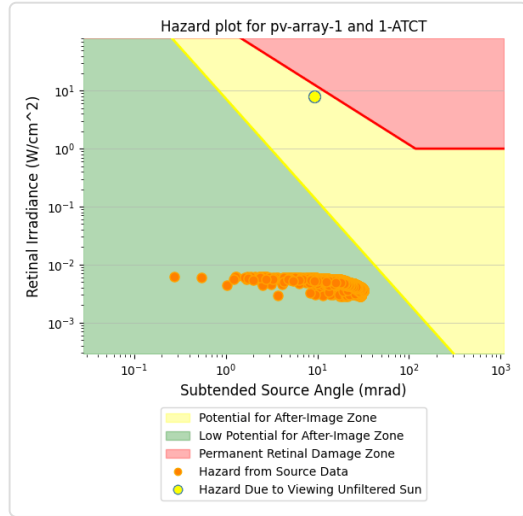
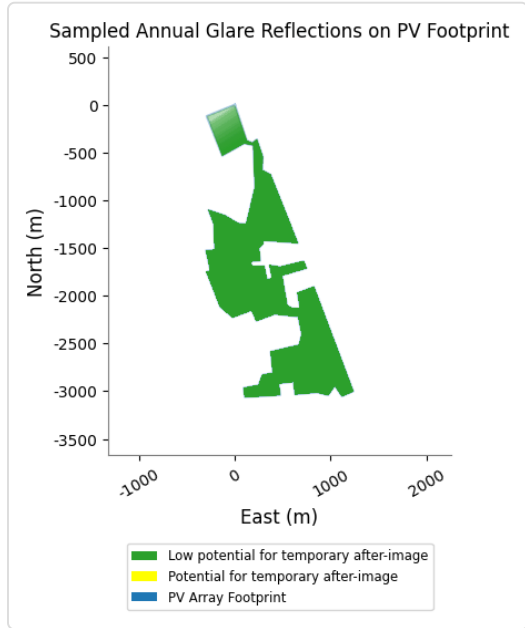
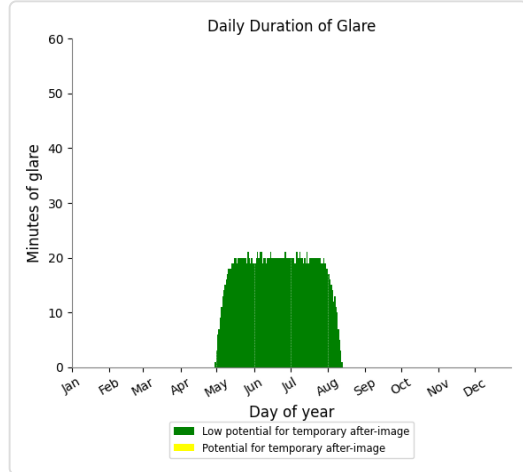
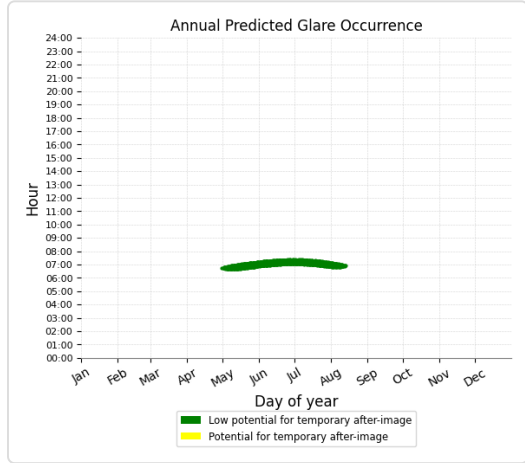
PV array 1 - Receptor (Sturgate Airfield - Runway 27)

No glare found

PV array 1 - OP Receptor (1-ATCT)

PV array is expected to produce the following glare for receptors at this location:

- 1,879 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 2 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	0	0
OP: 1-ATCT	1551	0

PV array 2 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 2 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 2 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 2 - Receptor (Gamston Airfield - Runway 32)

No glare found

PV array 2 - Receptor (Sturgate Airfield - Runway 09)

No glare found

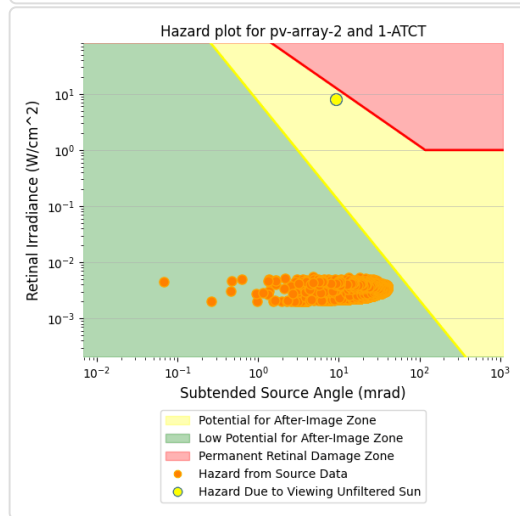
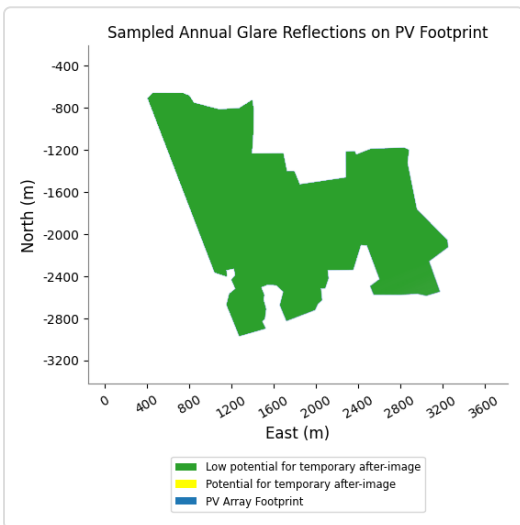
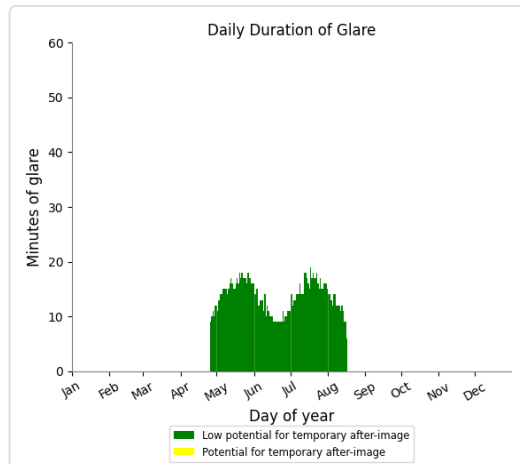
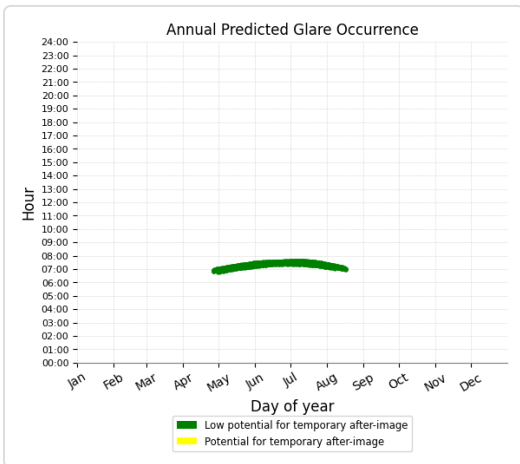
PV array 2 - Receptor (Sturgate Airfield - Runway 27)

No glare found

PV array 2 - OP Receptor (1-ATCT)

PV array is expected to produce the following glare for receptors at this location:

- 1,551 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 3 low potential for temporary after-image

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	0	0
OP: 1-ATCT	1344	0

PV array 3 - Receptor (Gamston Airfield - Runway 03)

No glare found

PV array 3 - Receptor (Gamston Airfield - Runway 14)

No glare found

PV array 3 - Receptor (Gamston Airfield - Runway 21)

No glare found

PV array 3 - Receptor (Gamston Airfield - Runway 32)

No glare found

PV array 3 - Receptor (Sturgate Airfield - Runway 09)

No glare found

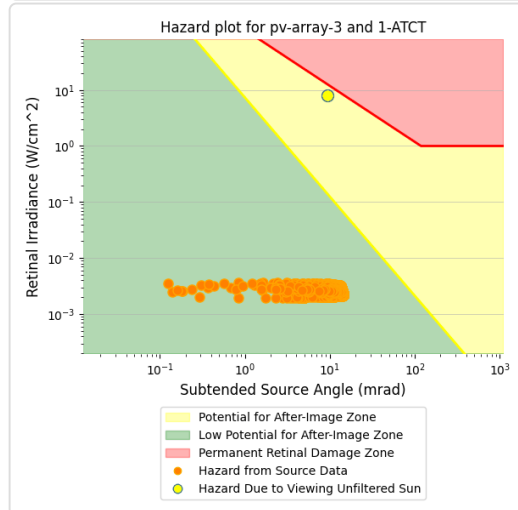
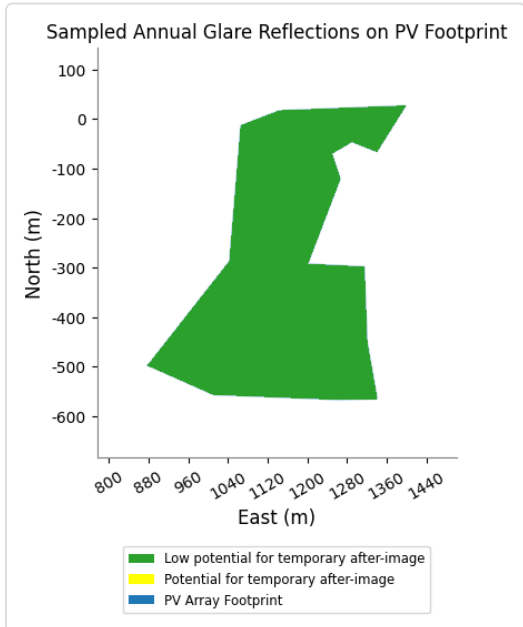
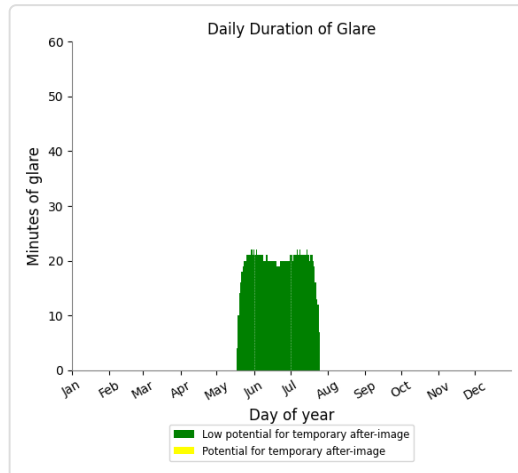
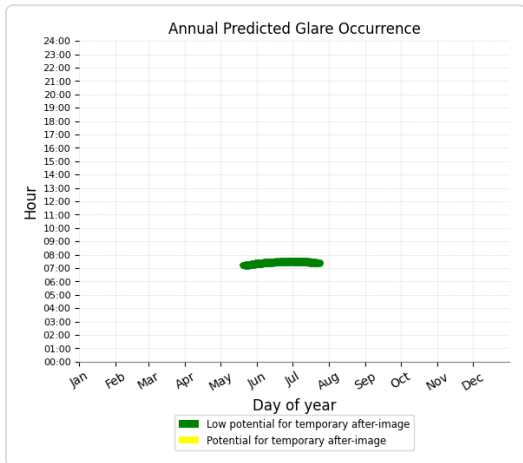
PV array 3 - Receptor (Sturgate Airfield - Runway 27)

No glare found

PV array 3 - OP Receptor (1-ATCT)

PV array is expected to produce the following glare for receptors at this location:

- 1,344 minutes of "green" glare with low potential to cause temporary after-image.
- 0 minutes of "yellow" glare with potential to cause temporary after-image.



PV array 4 no glare found

Component	Green glare (min)	Yellow glare (min)
FP: Gamston Airfield - Runway 03	0	0
FP: Gamston Airfield - Runway 14	0	0
FP: Gamston Airfield - Runway 21	0	0
FP: Gamston Airfield - Runway 32	0	0
FP: Sturgate Airfield - Runway 09	0	0
FP: Sturgate Airfield - Runway 27	0	0
OP: 1-ATCT	0	0

No glare found

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not automatically account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- Detailed system geometry is not rigorously simulated.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values and results may vary.
- The system output calculation is a DNI-based approximation that assumes clear, sunny skies year-round. It should not be used in place of more rigorous modeling methods.
- Several V1 calculations utilize the PV array centroid, rather than the actual glare spot location, due to algorithm limitations. This may affect results for large PV footprints. Additional analyses of array sub-sections can provide additional information on expected glare.
- The subtended source angle (glare spot size) is constrained by the PV array footprint size. Partitioning large arrays into smaller sections will reduce the maximum potential subtended angle, potentially impacting results if actual glare spots are larger than the sub-array size. Additional analyses of the combined area of adjacent sub-arrays can provide more information on potential glare hazards. (See previous point on related limitations.)
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass a continuous, not discrete, spectrum.
- Glare locations displayed on receptor plots are approximate. Actual glare-spot locations may differ.
- Refer to the **Help page** for detailed assumptions and limitations not listed here.

ANNEX N: VISIBILITY ASSESSMENT EVIDENCE



Annex N: Visibility Assessment Evidence



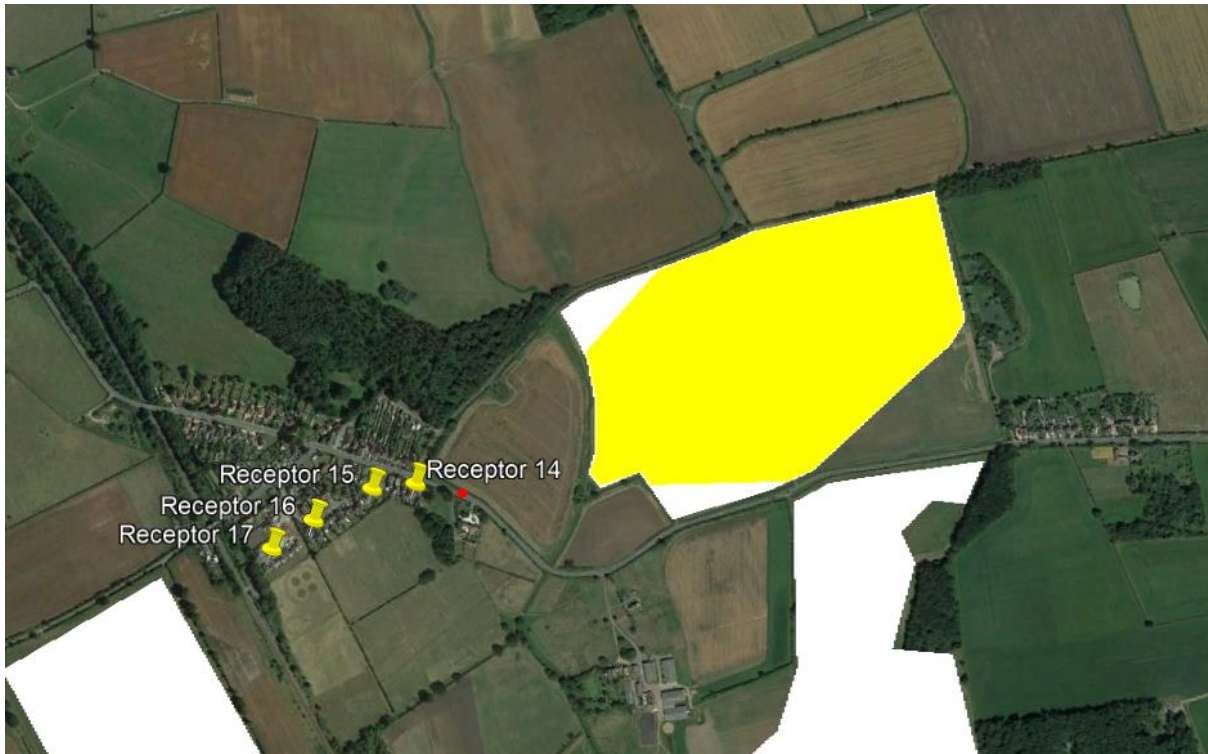
Left Blank

Residential Receptors

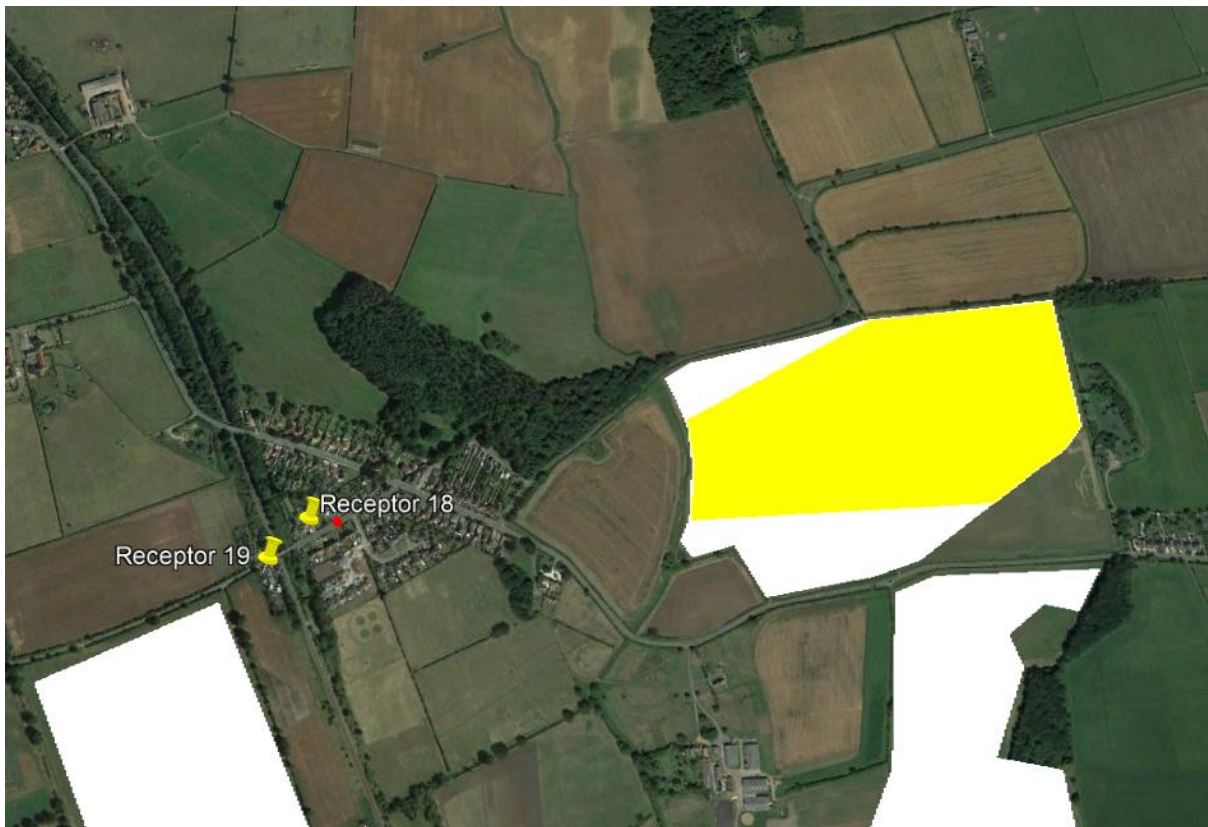
Receptors 10 - 13



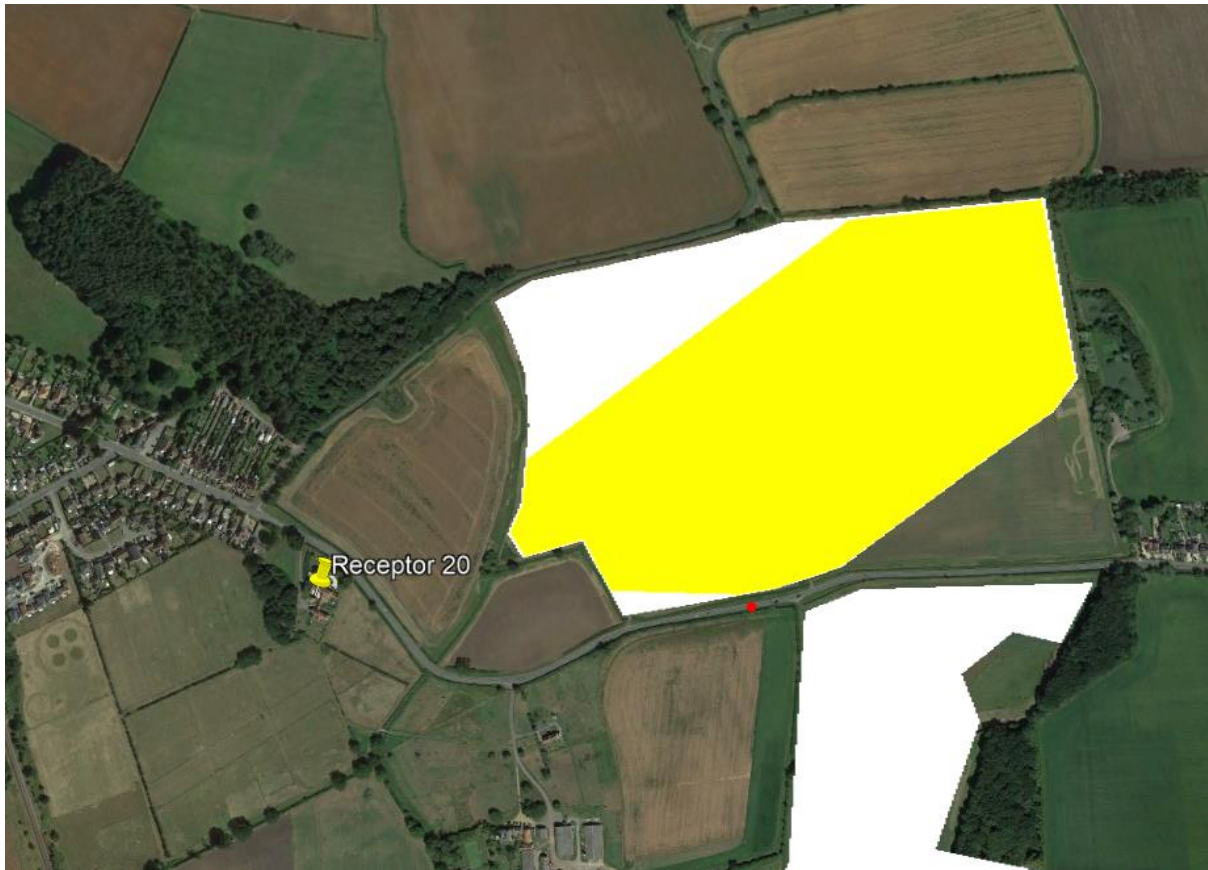
Receptors 14 - 17



Receptors 18 - 19



Receptor 20



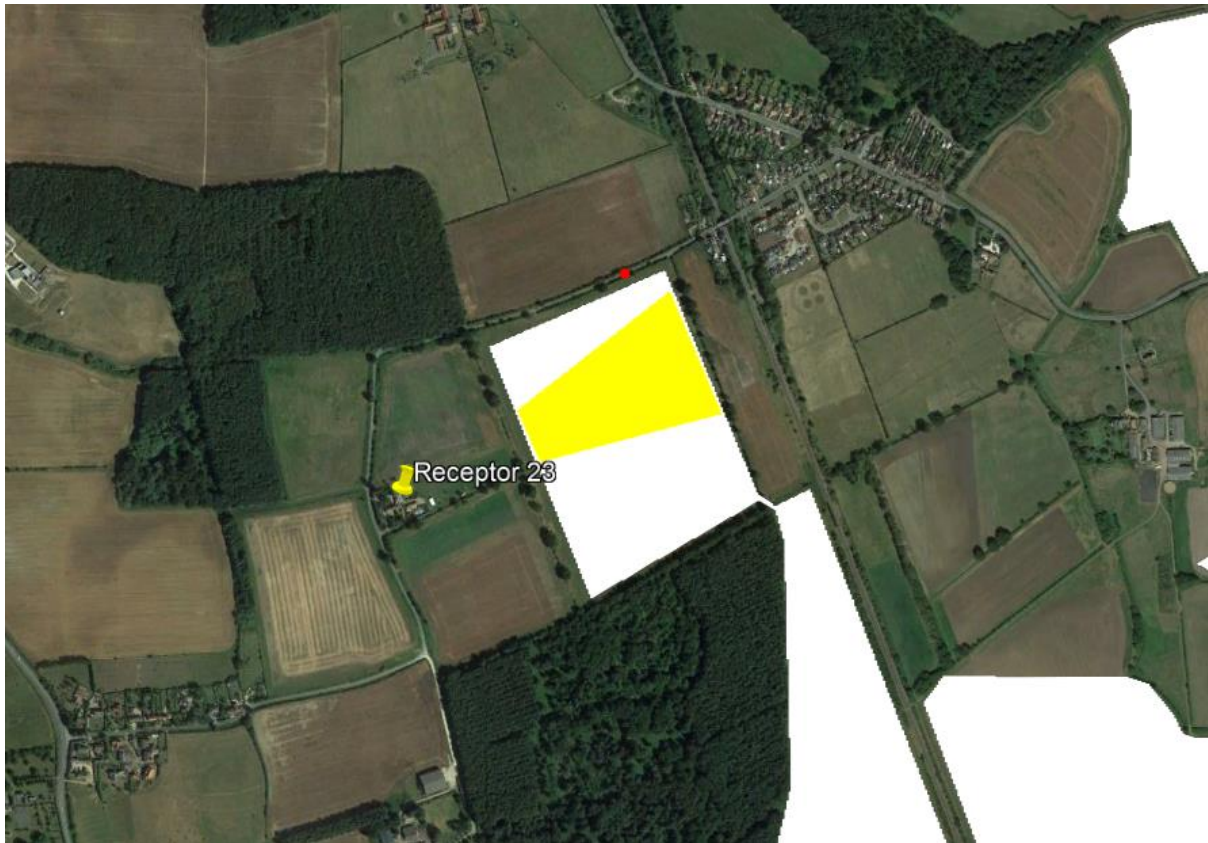
Receptor 21



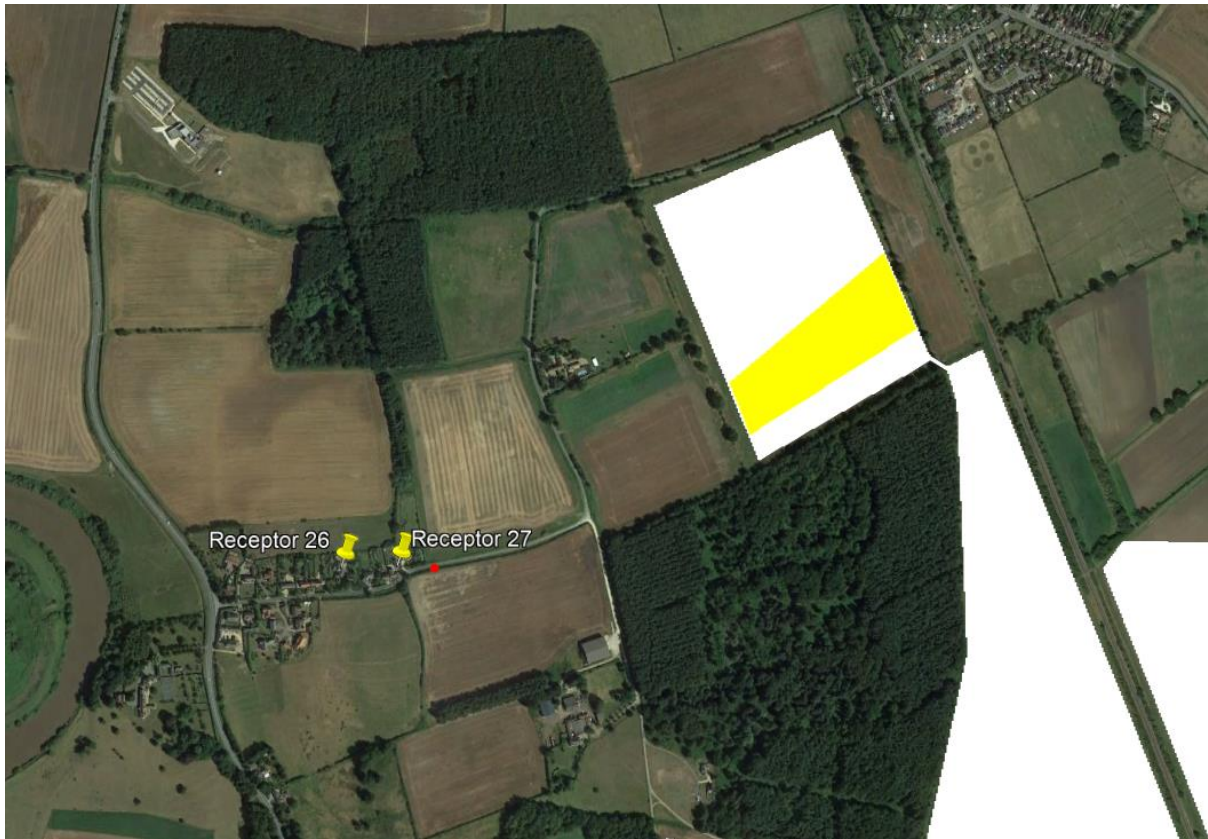
Receptor 22



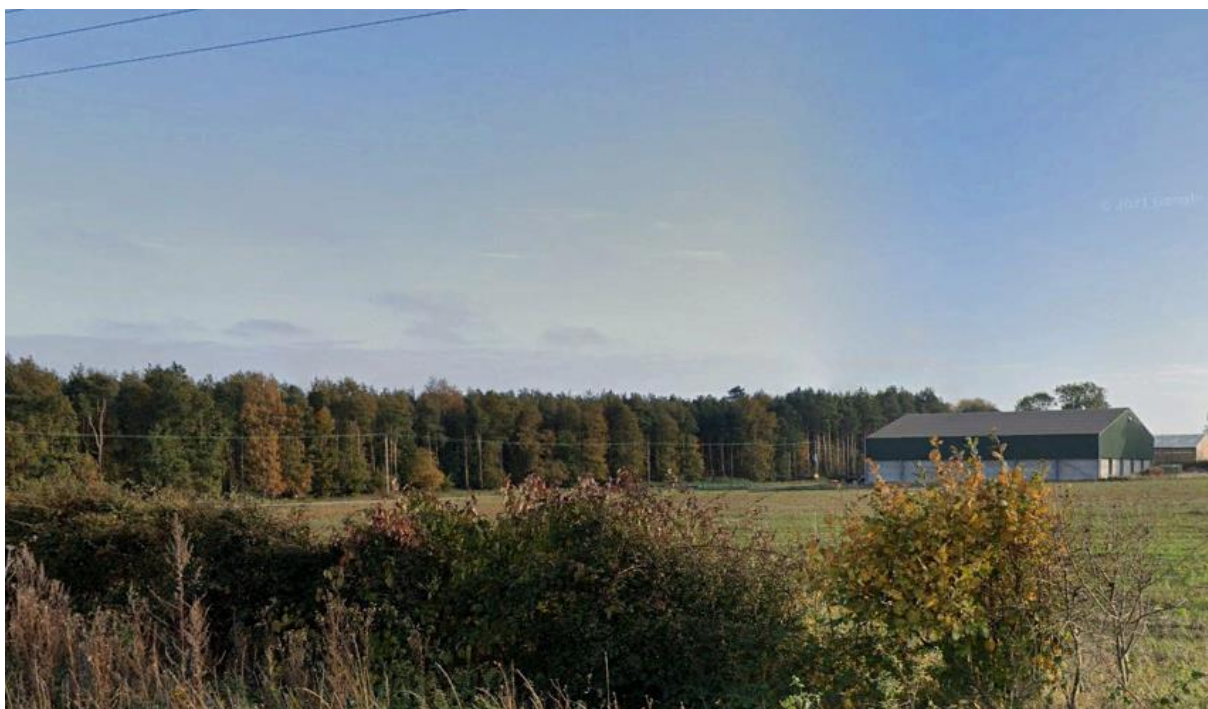
Receptor 23



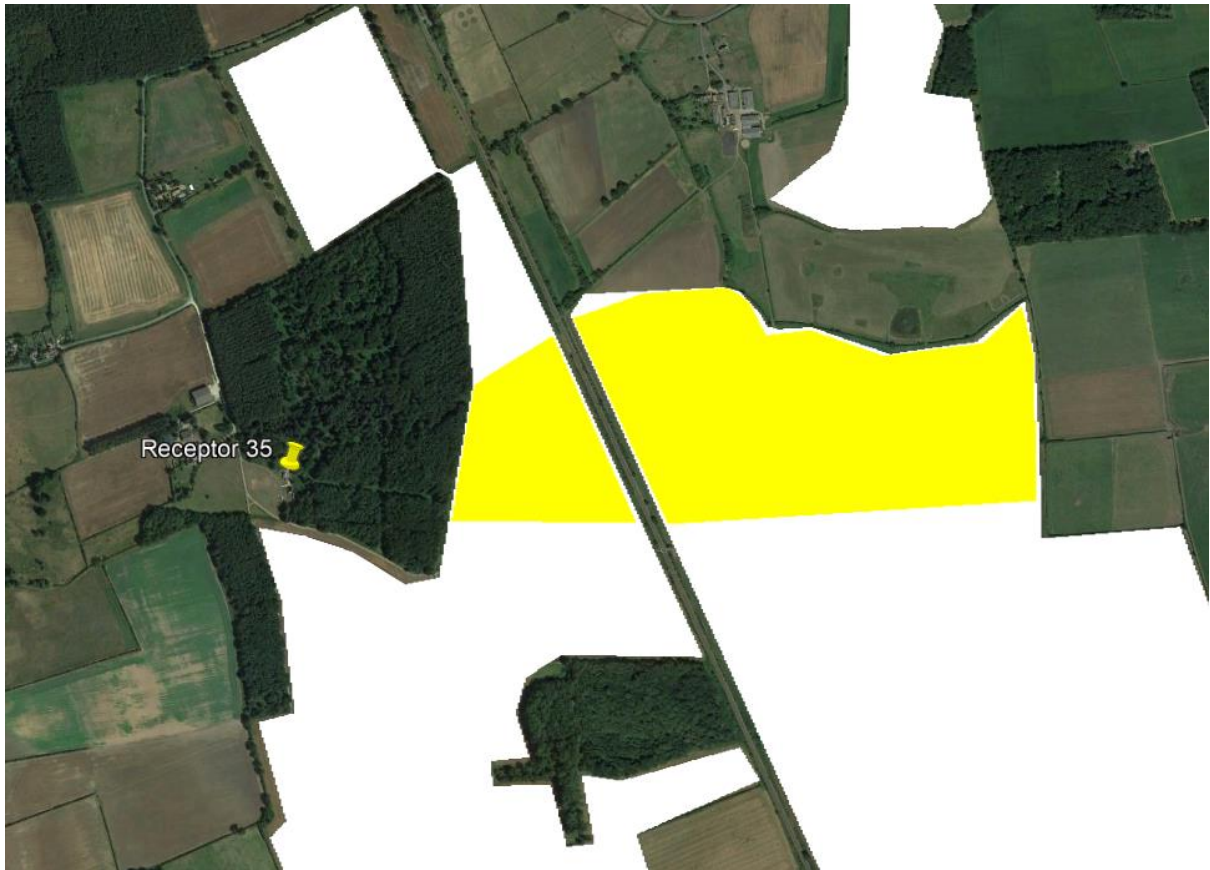
Receptors 26 - 27



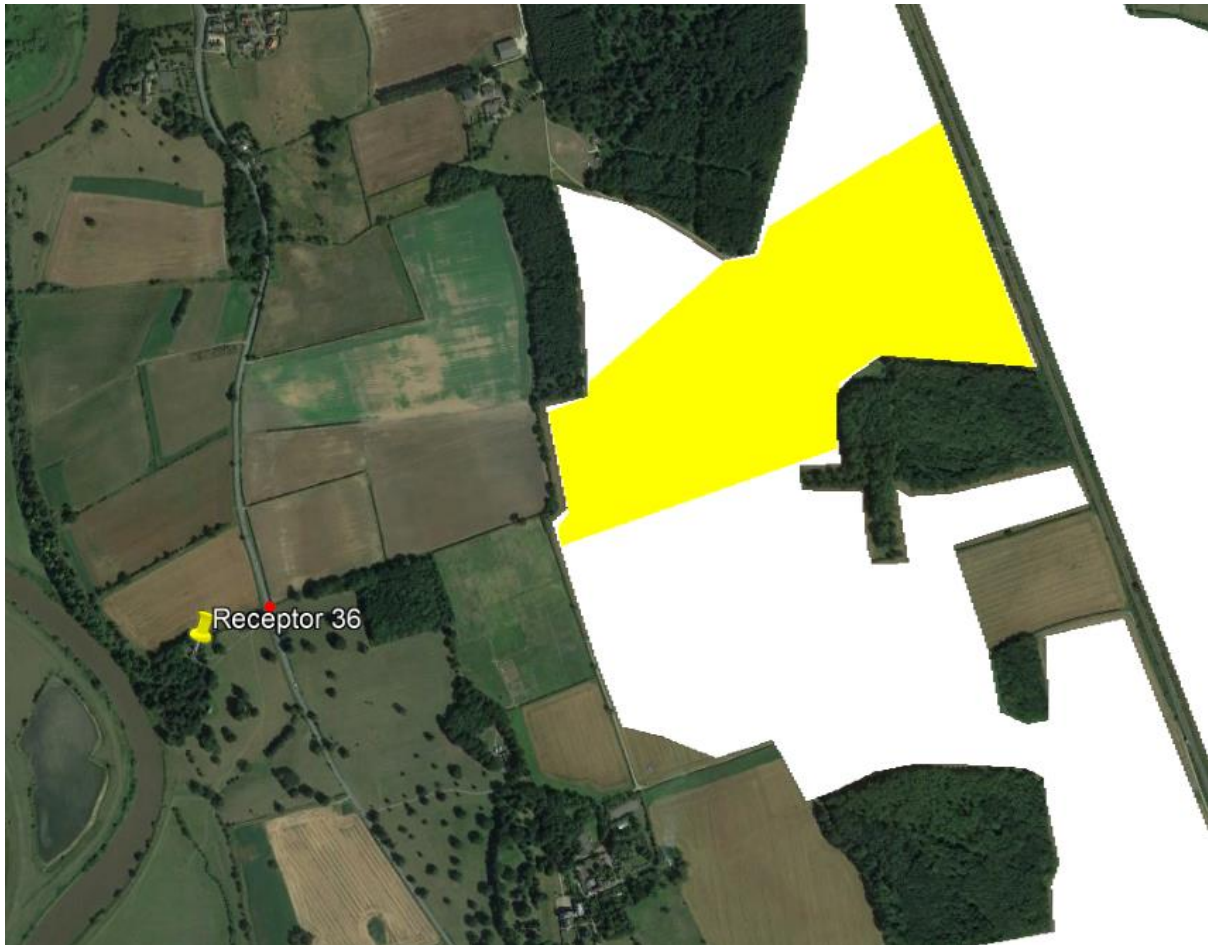
Receptors 32 - 34



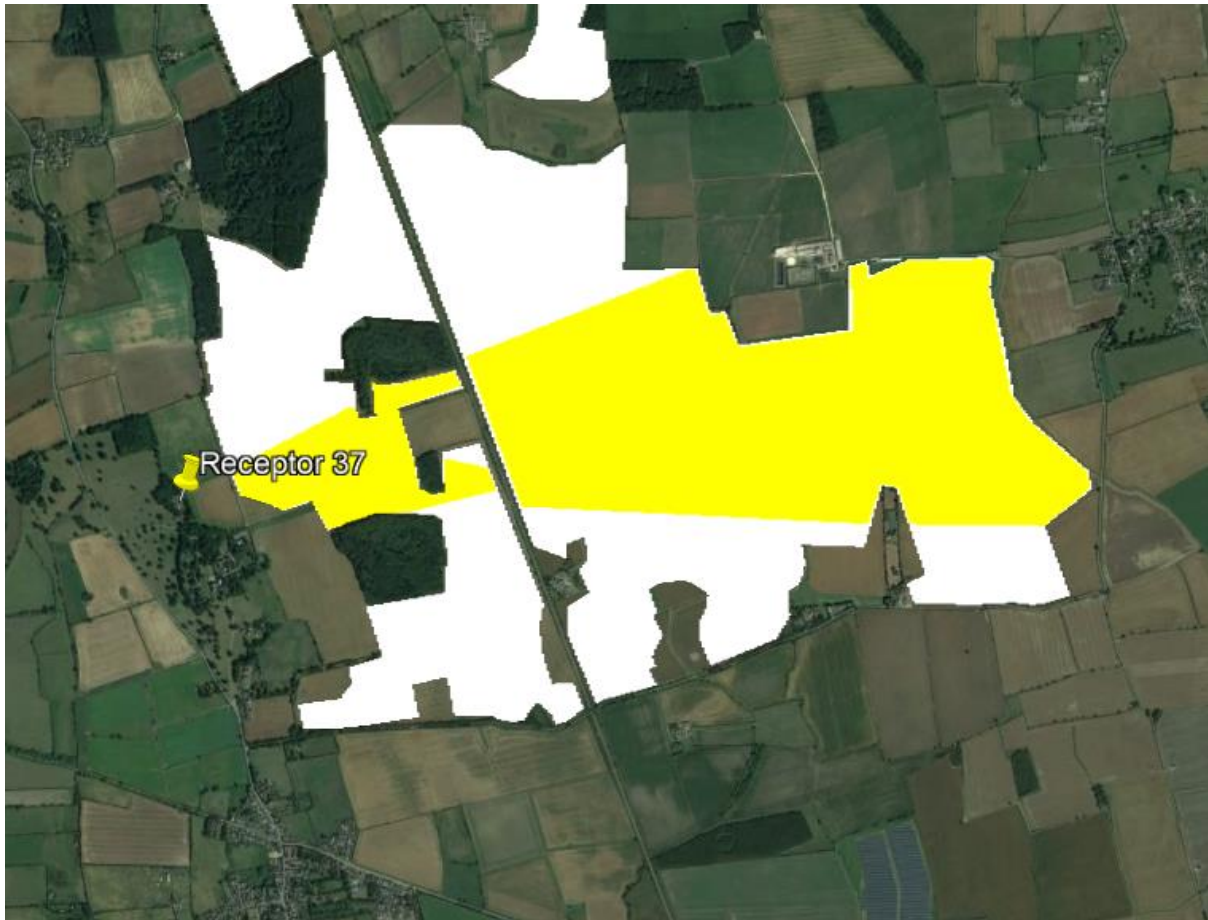
Receptor 35



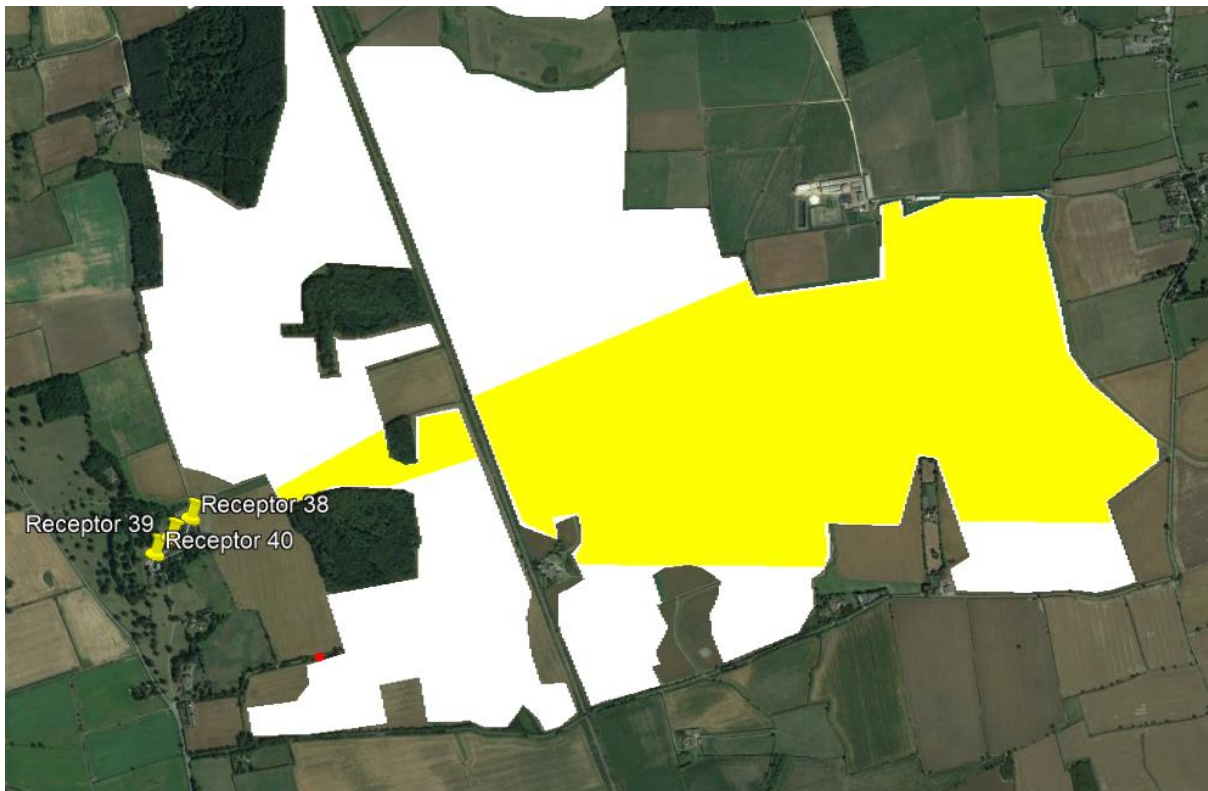
Receptor 36



Receptor 37



Receptors 38 - 40



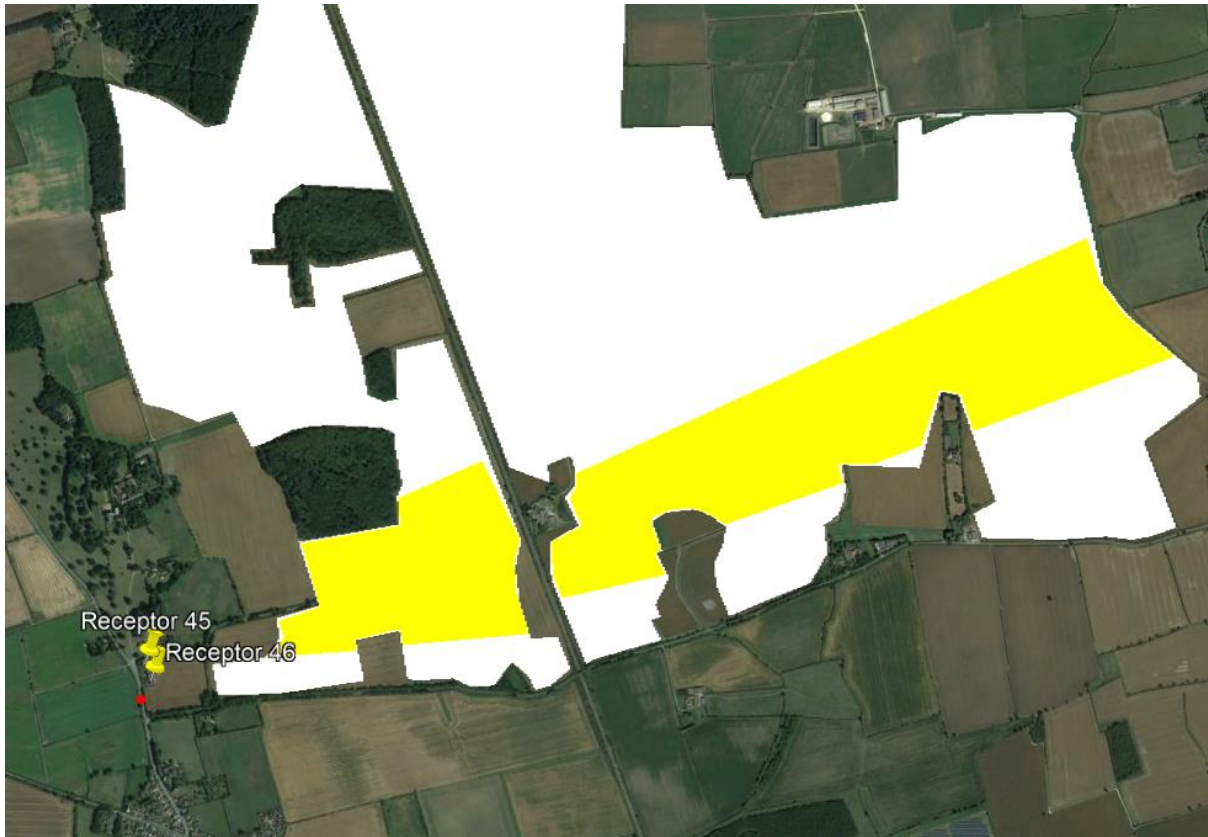
Receptor 41



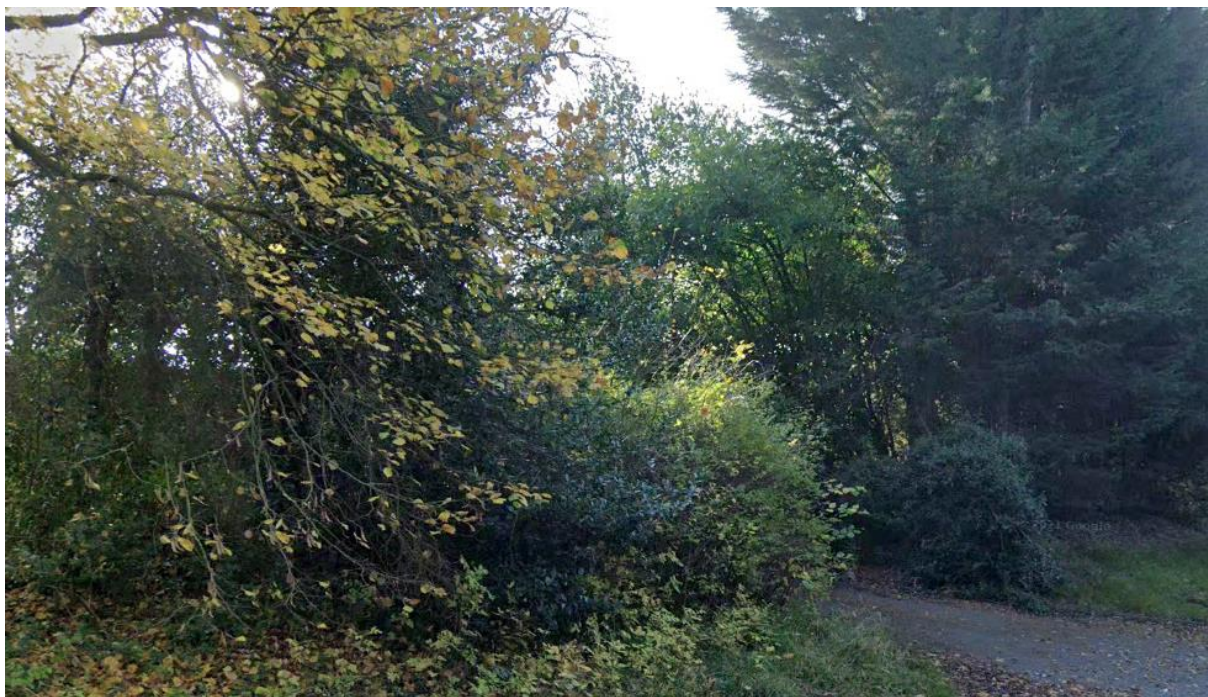
Receptors 42 - 44



Receptors 45 - 46



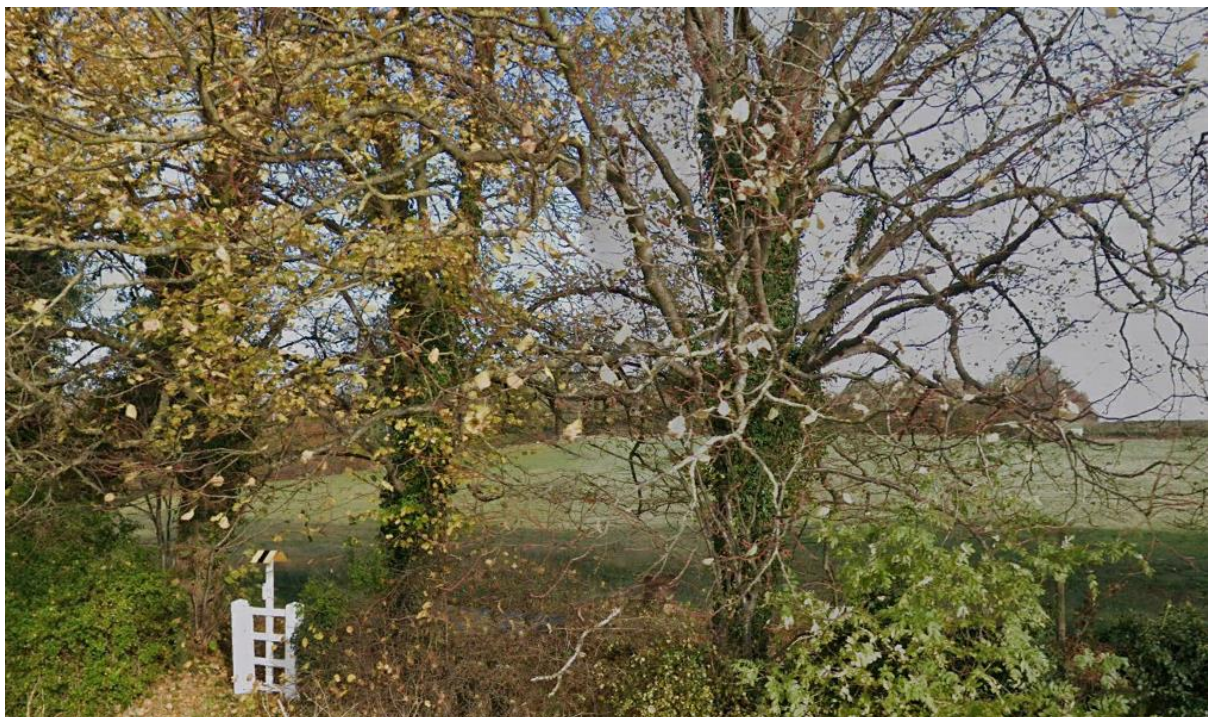
Receptor 47



Receptors 48, 49 and 54



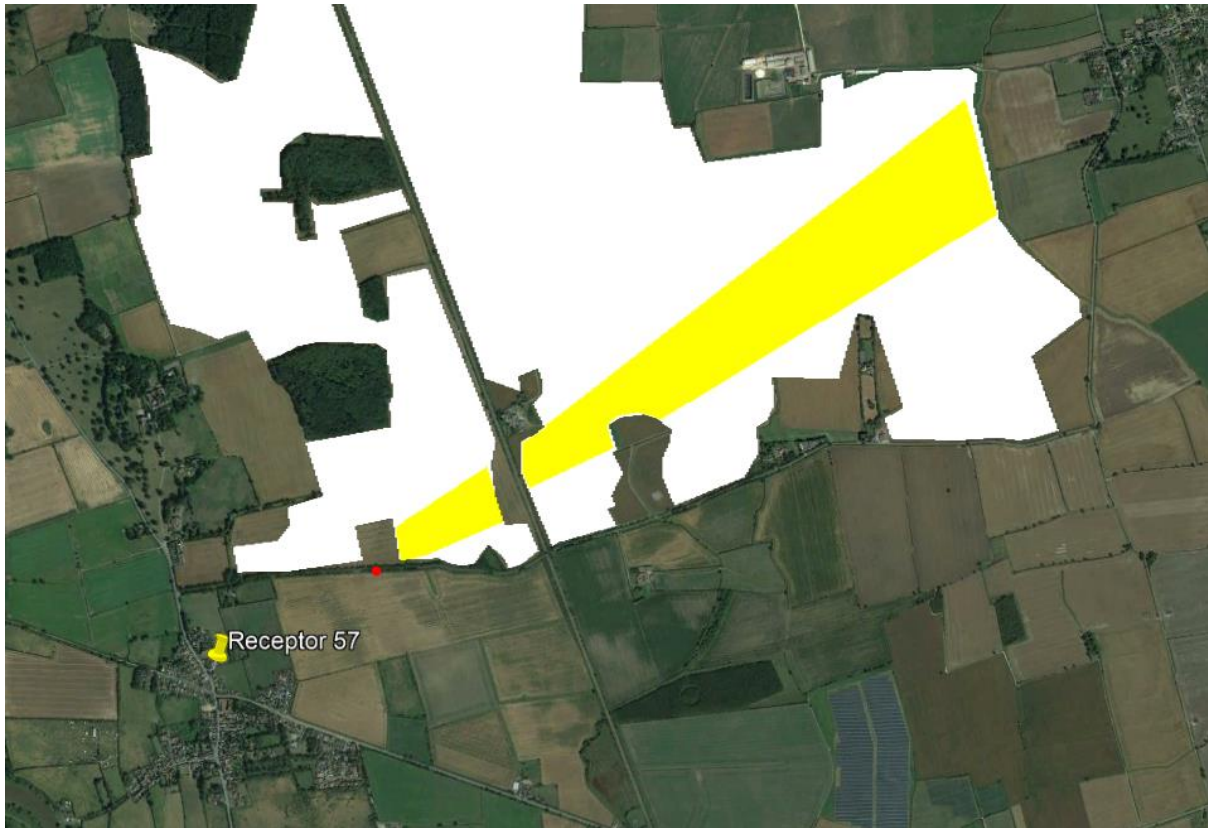
Receptors 50 - 52



Receptor 53, 55 and 56



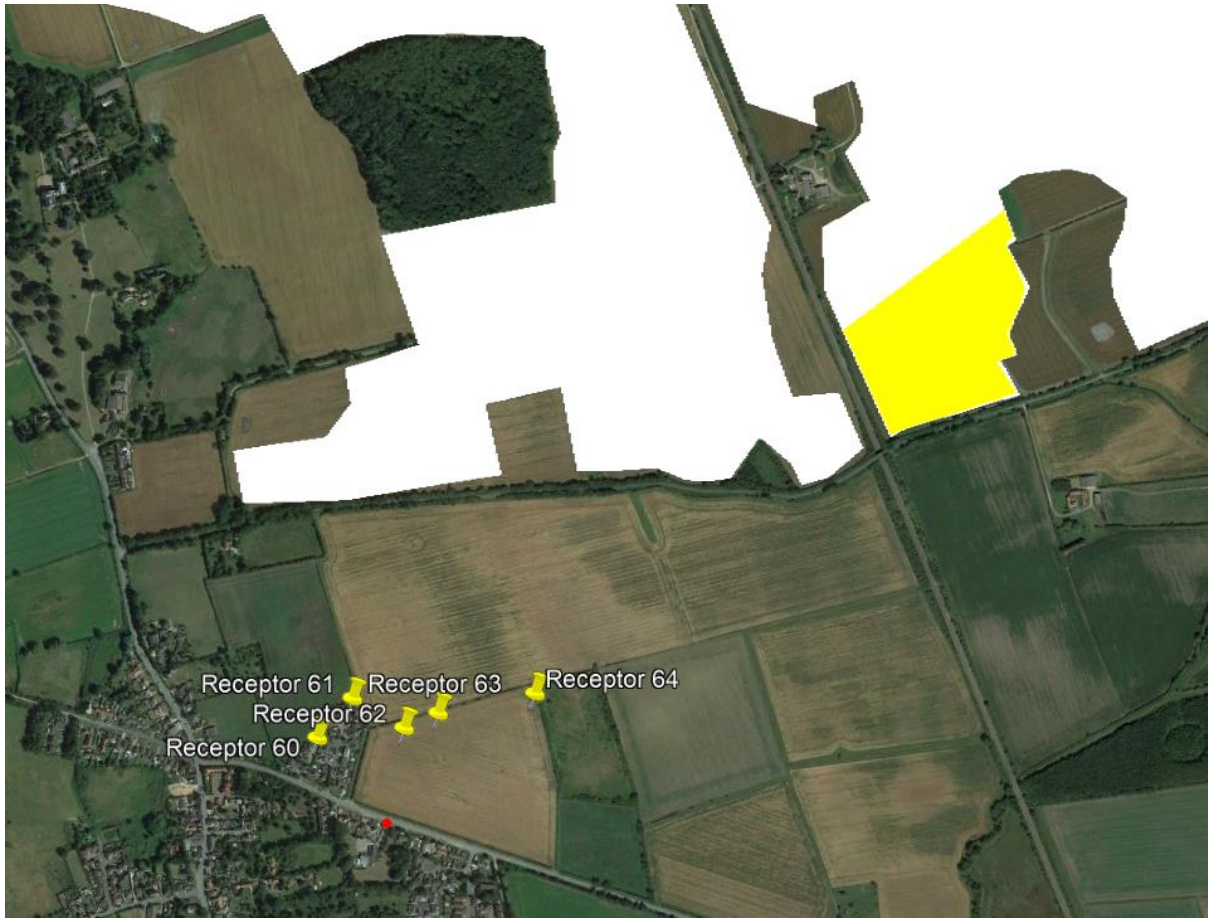
Receptor 57



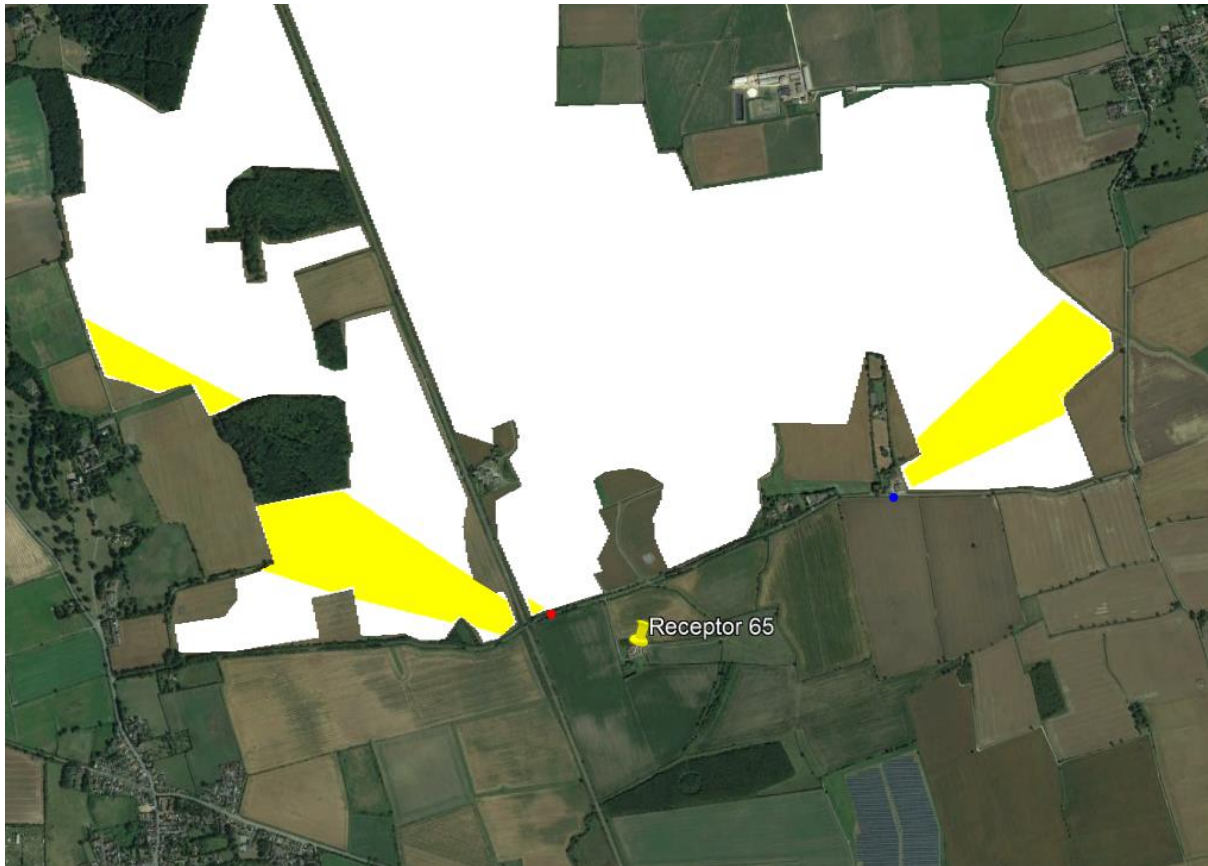
Receptors 58 - 59



Receptors 60 - 64

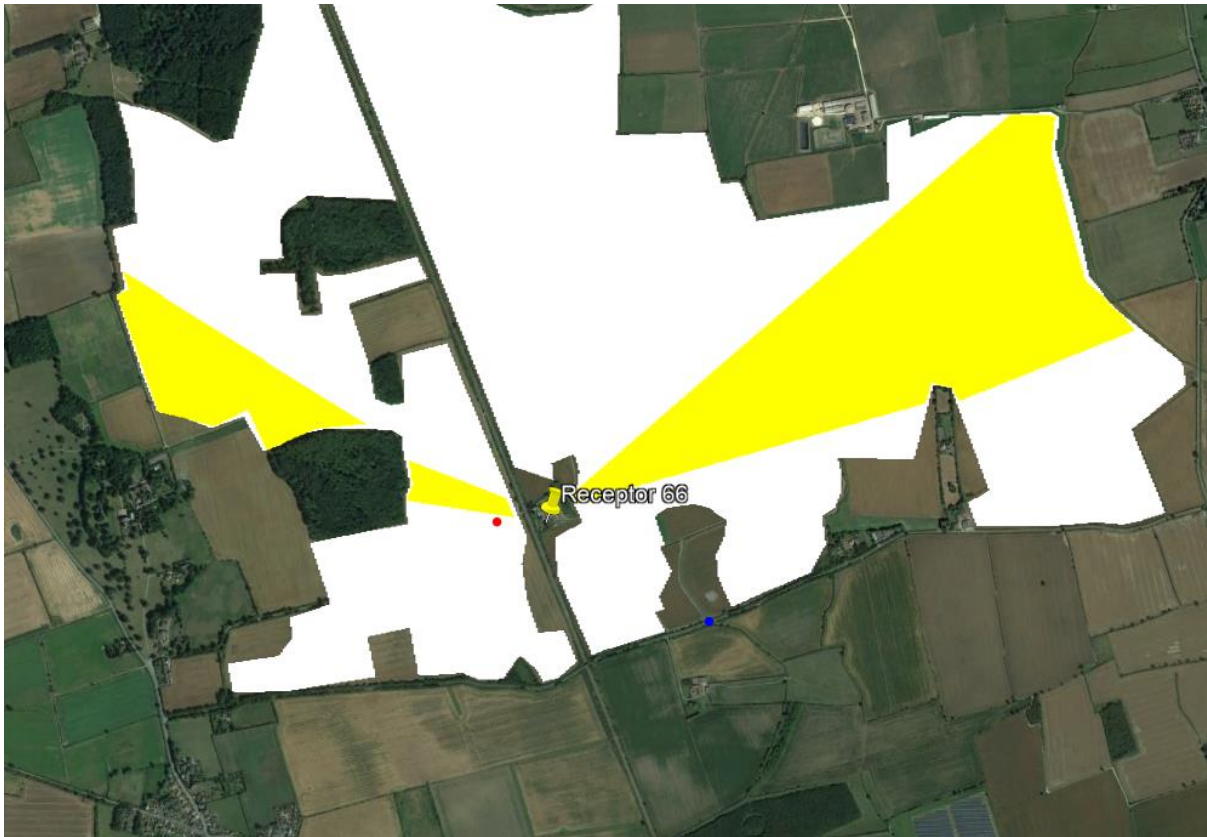


Receptor 65





Receptor 66





Receptor 67





Receptor 68



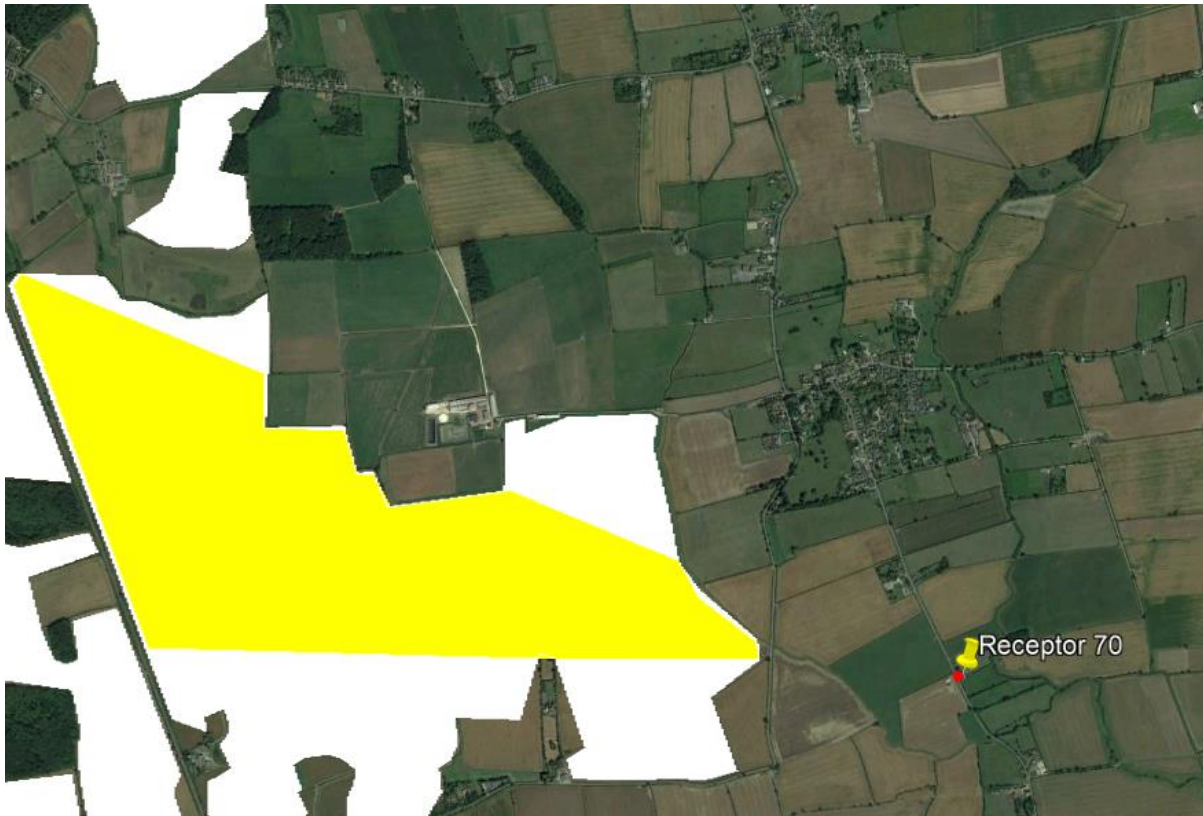


Receptor 69

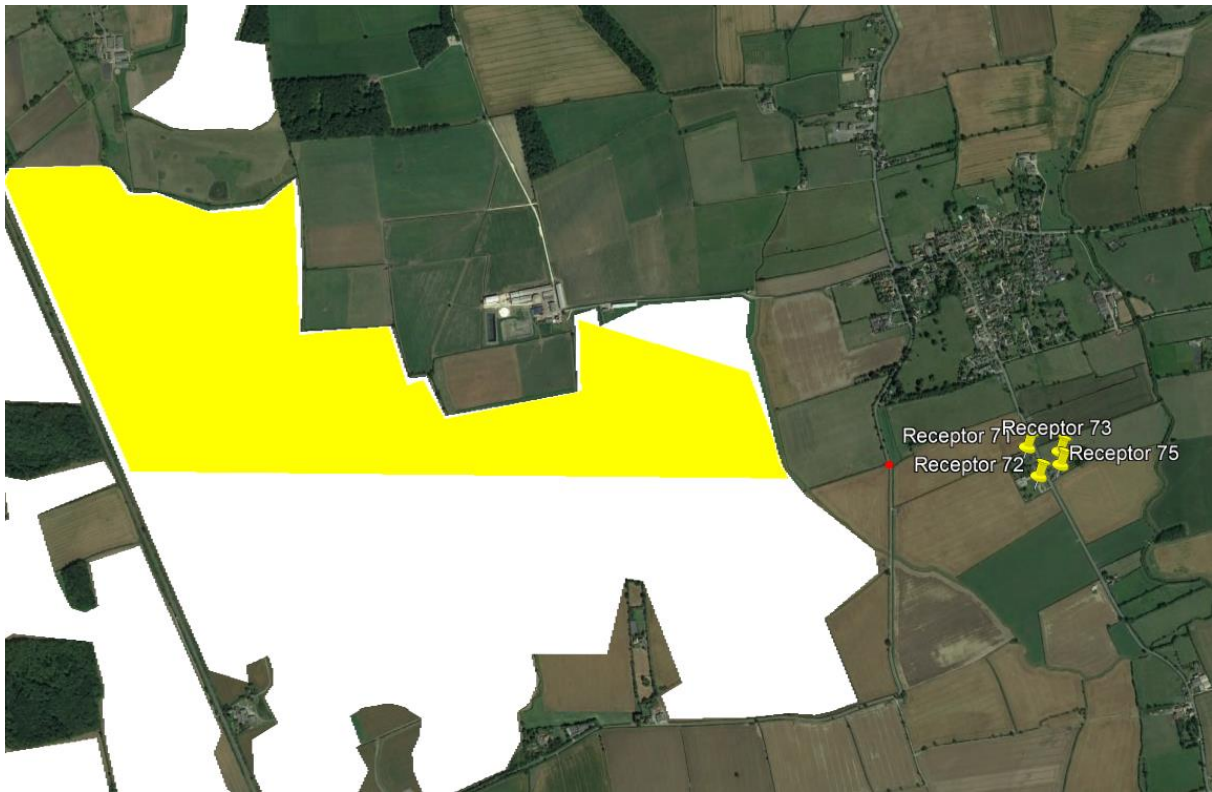




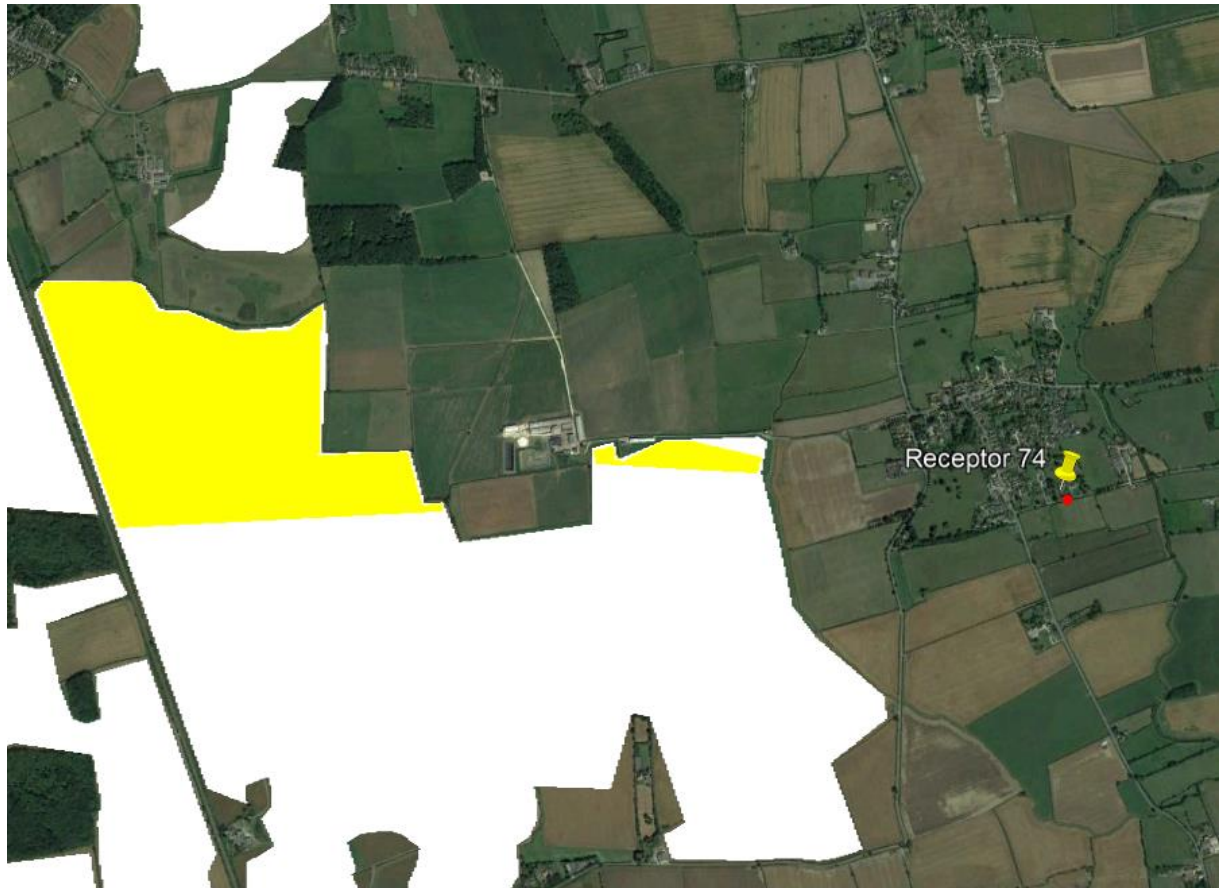
Receptor 70



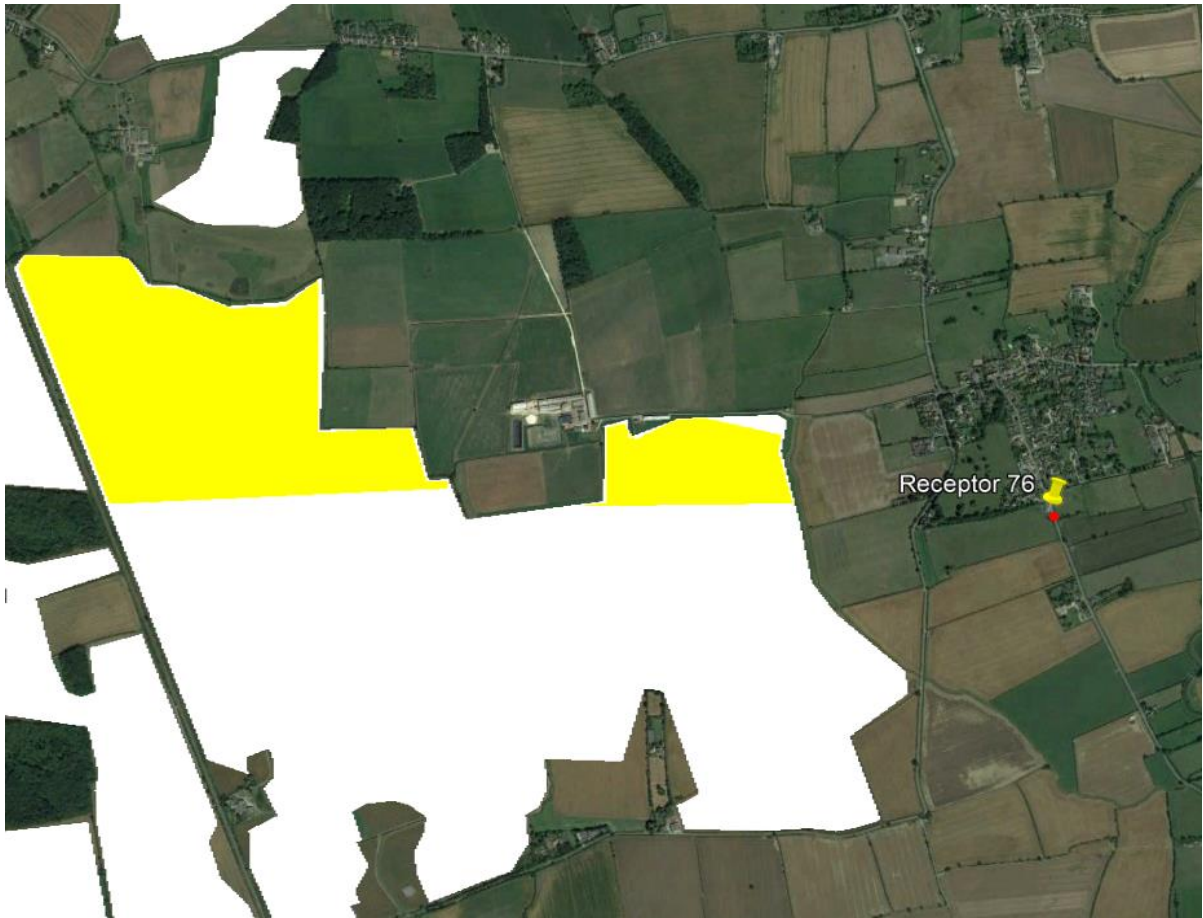
Receptors 71 – 73 and 75



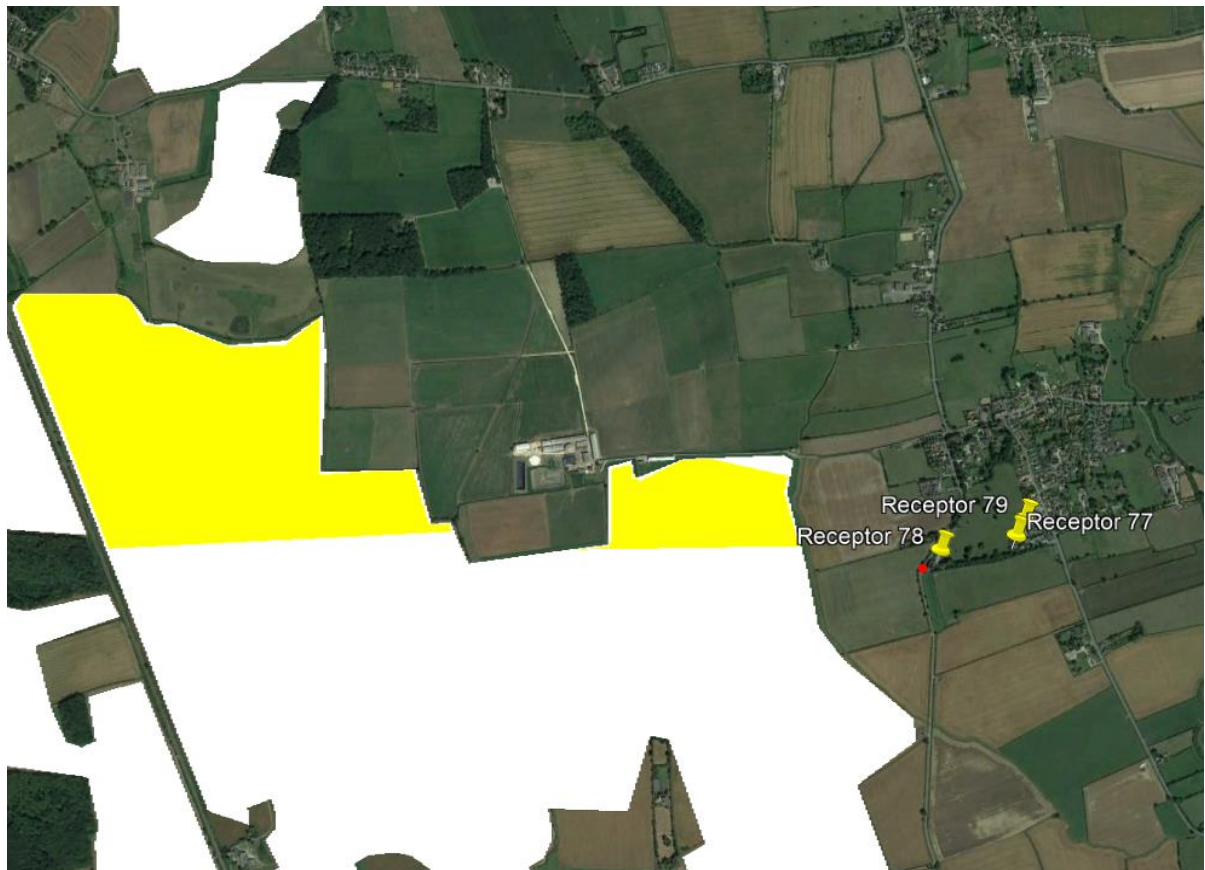
Receptor 74



Receptor 76



Receptors 77 – 79



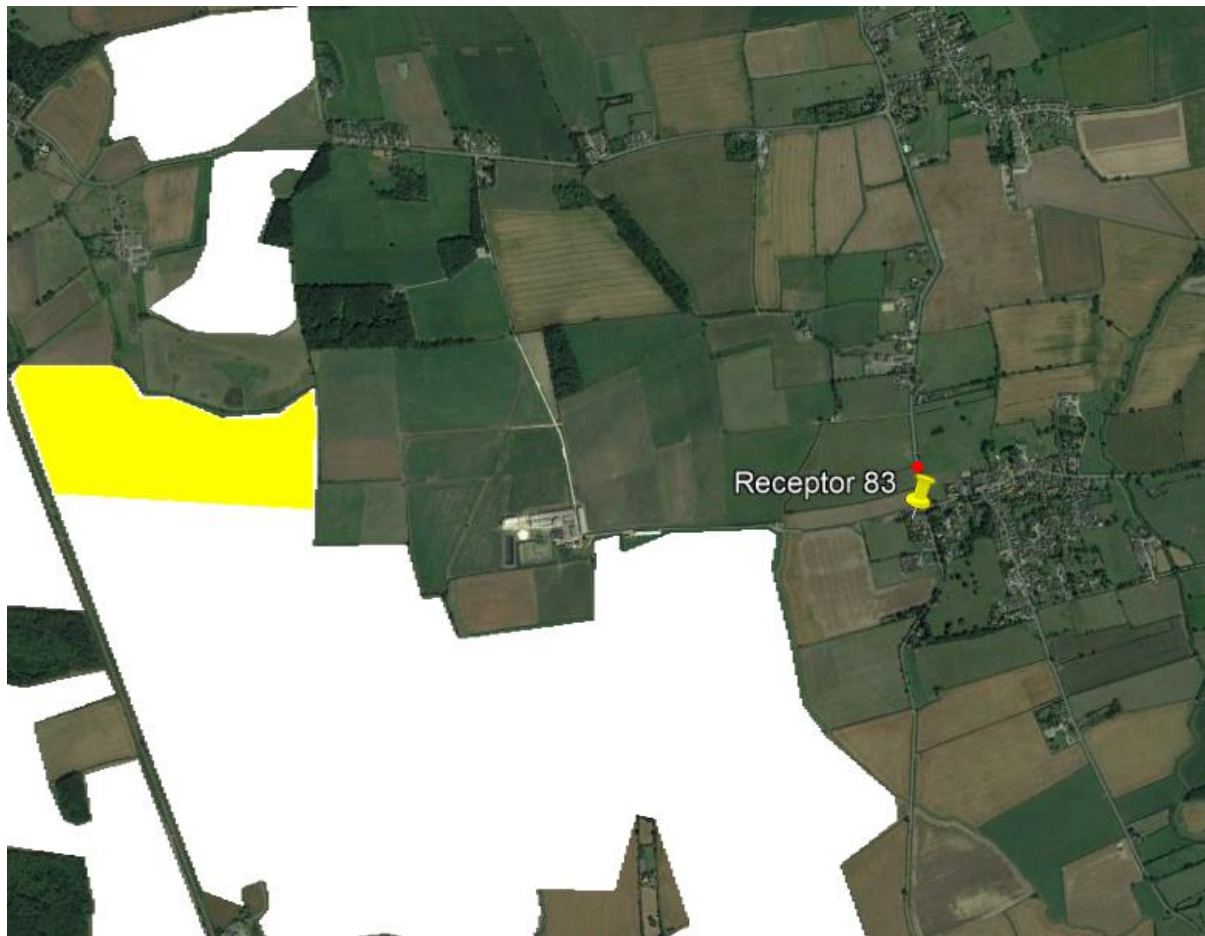
Receptors 80 – 81



Receptor 82



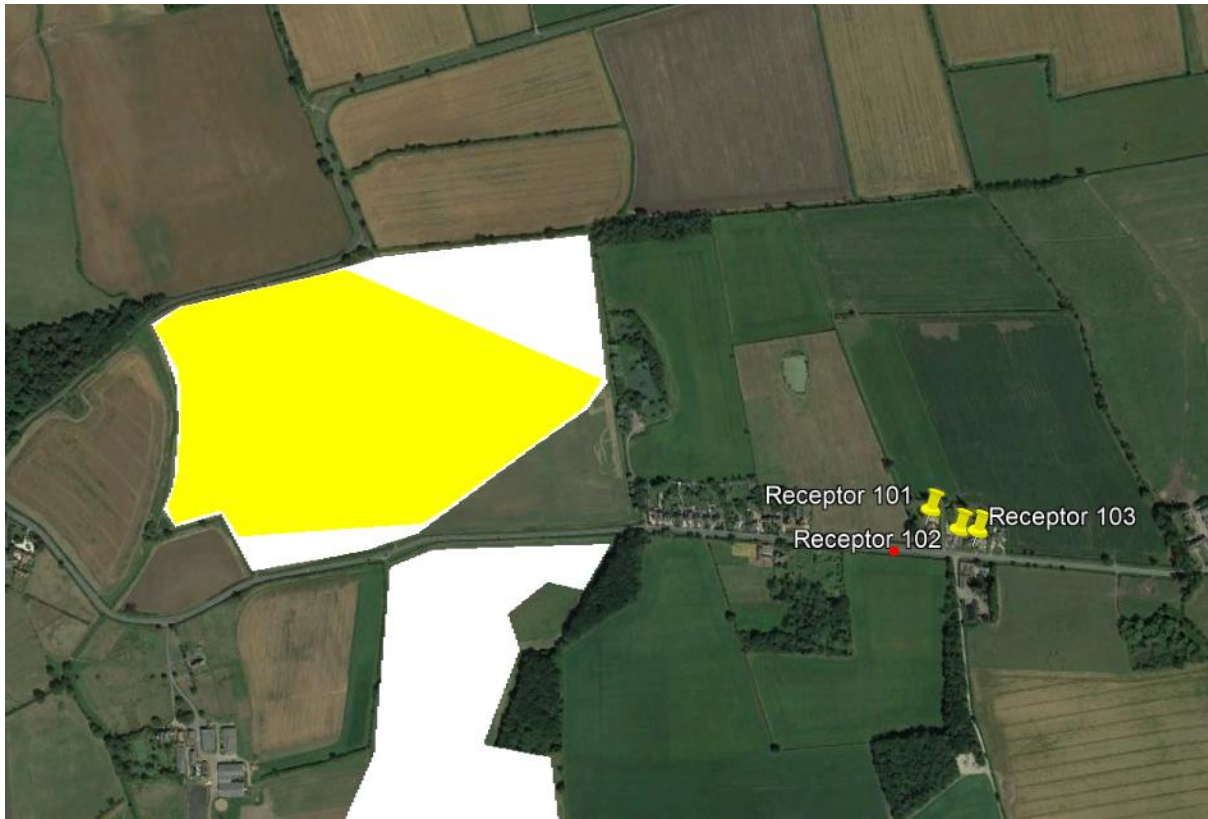
Receptor 83



Receptors 97 – 100



Receptors 101 – 103



Receptor 104



Receptor 105



Receptor 106

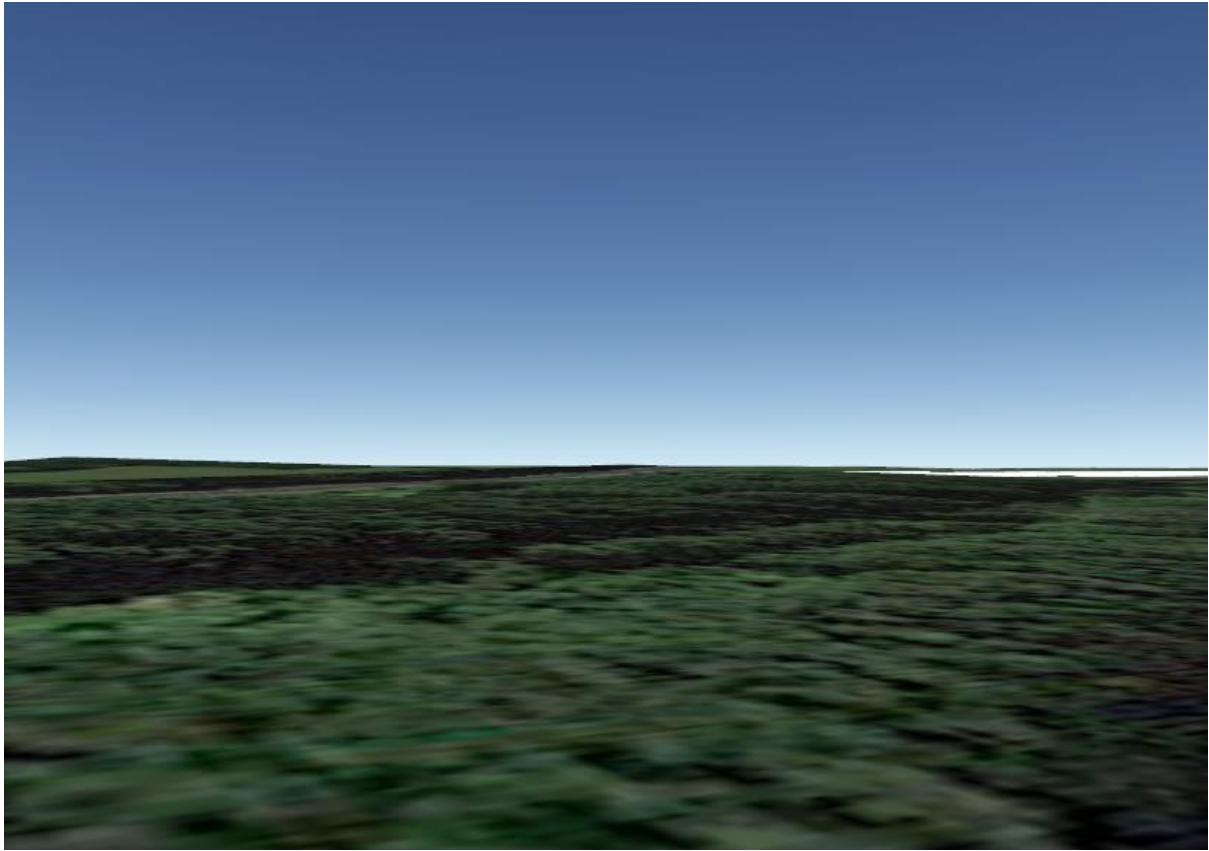


Receptor 107

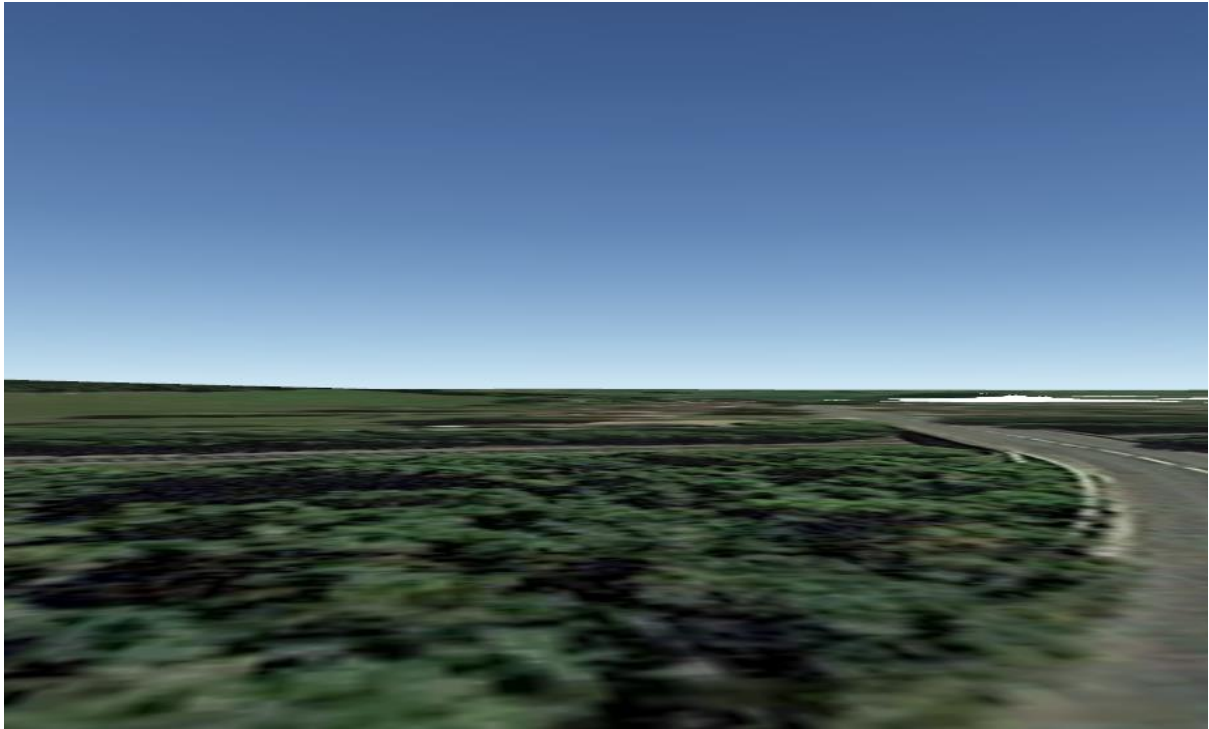


Road Receptors

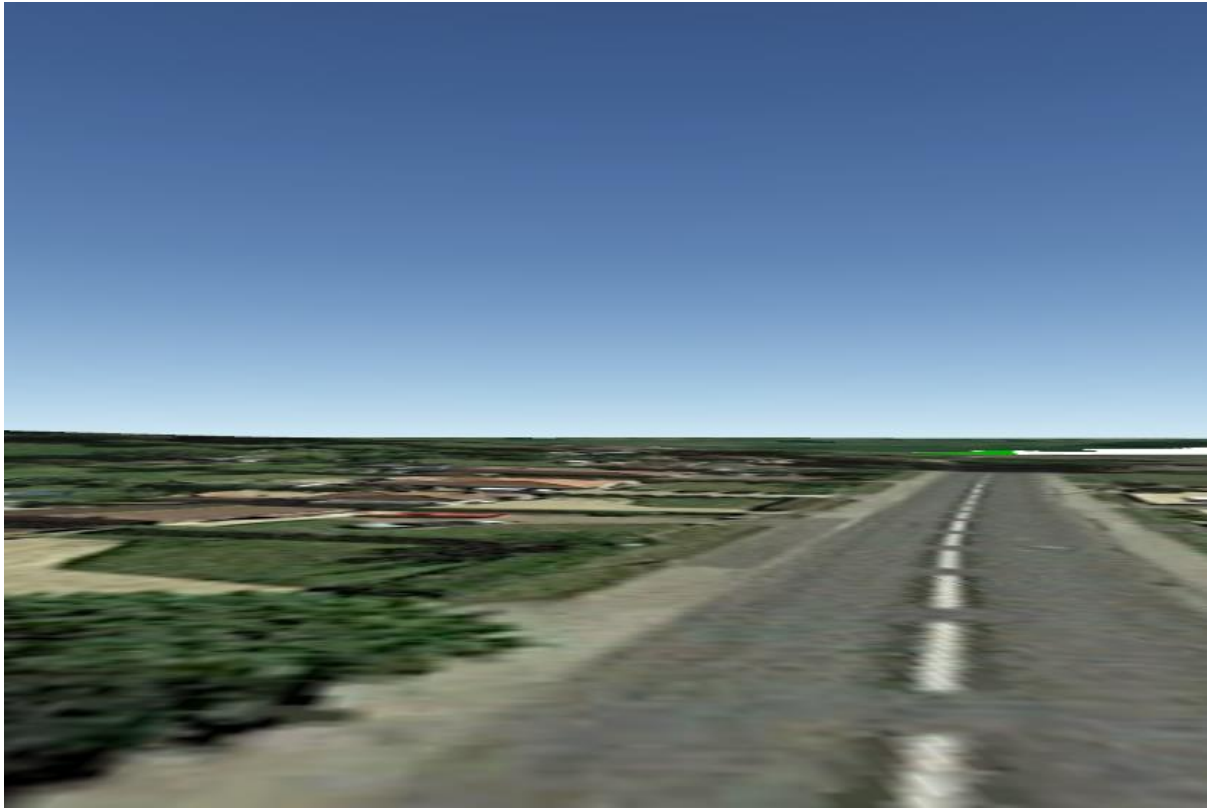
Receptor 4



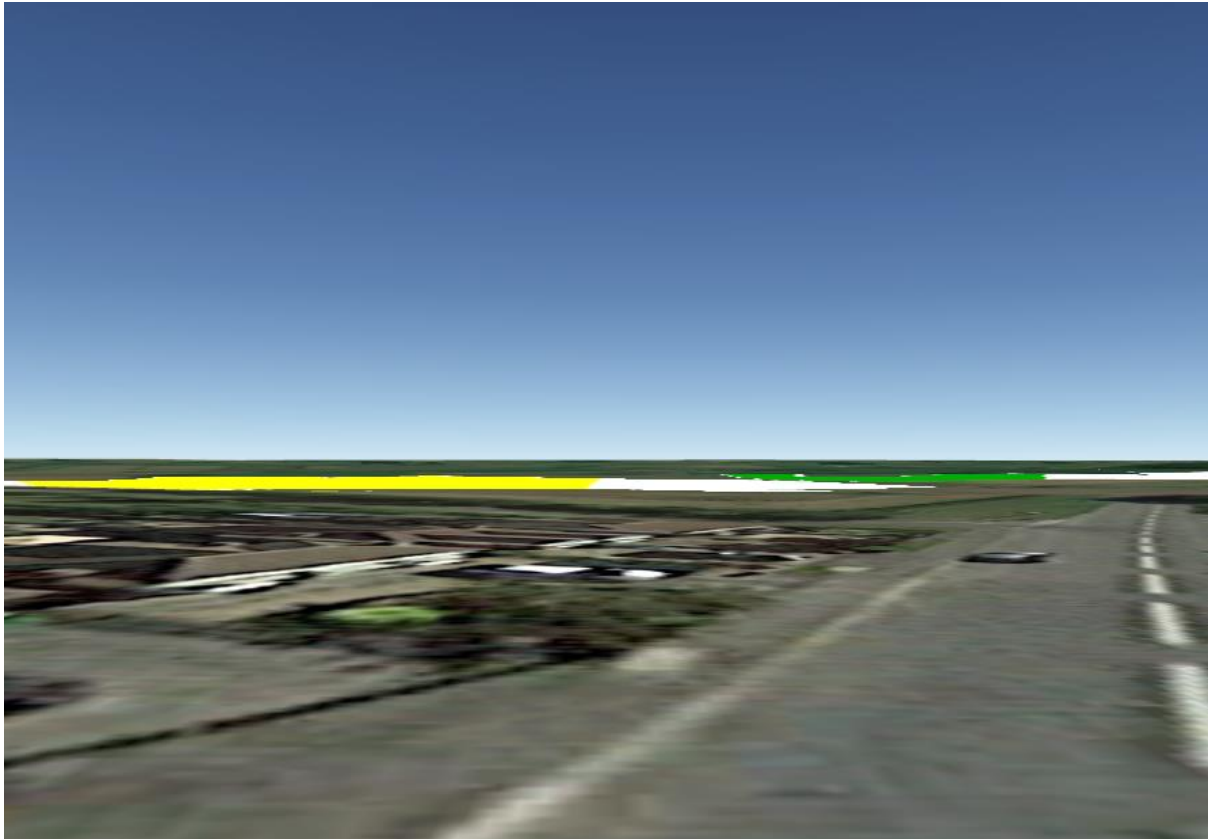
Receptor 5



Receptor 6

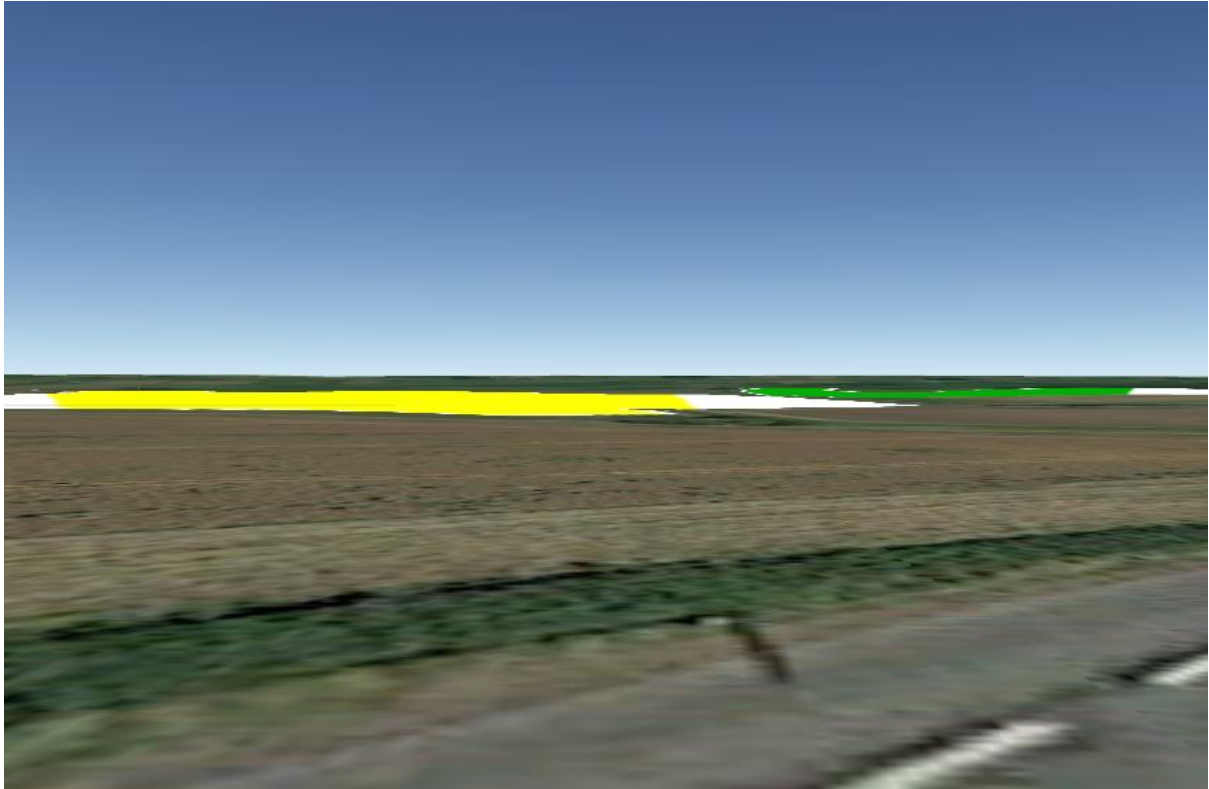


Receptor 7

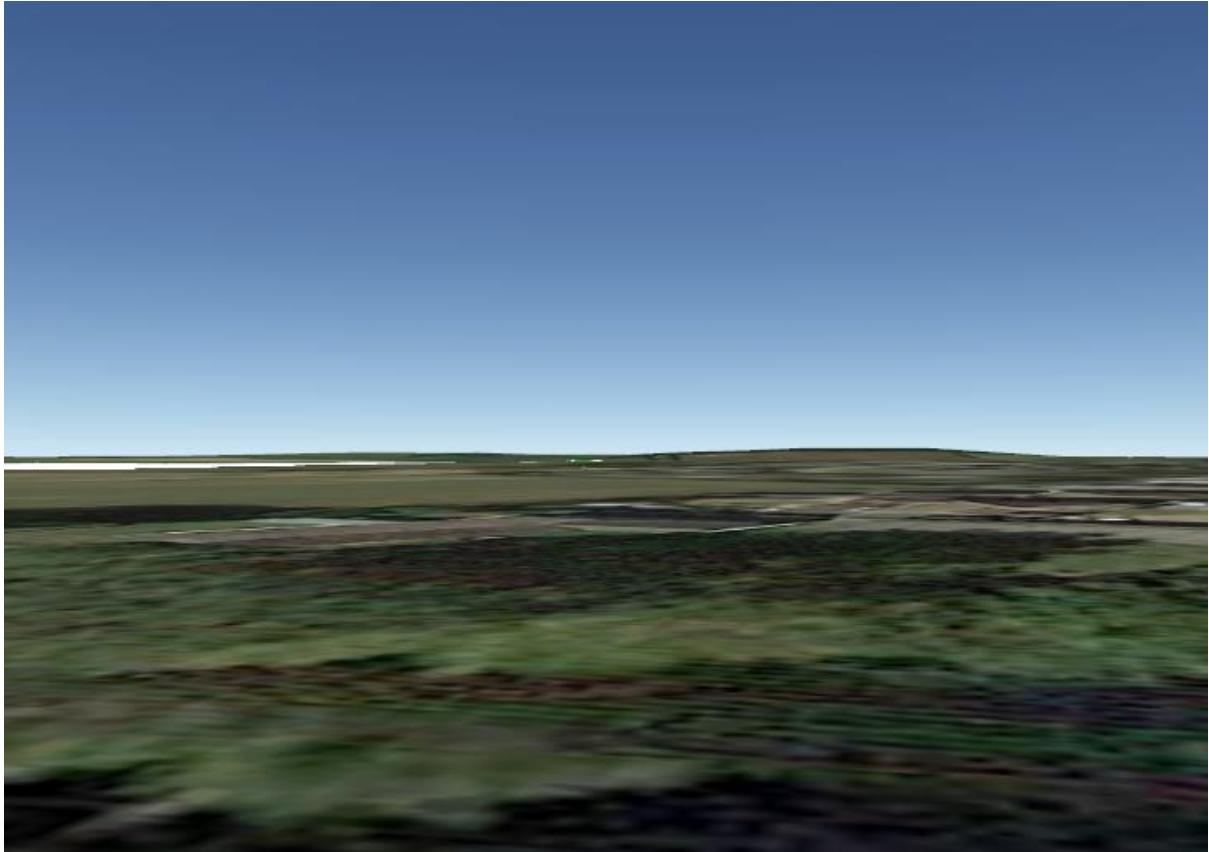


Receptor 8

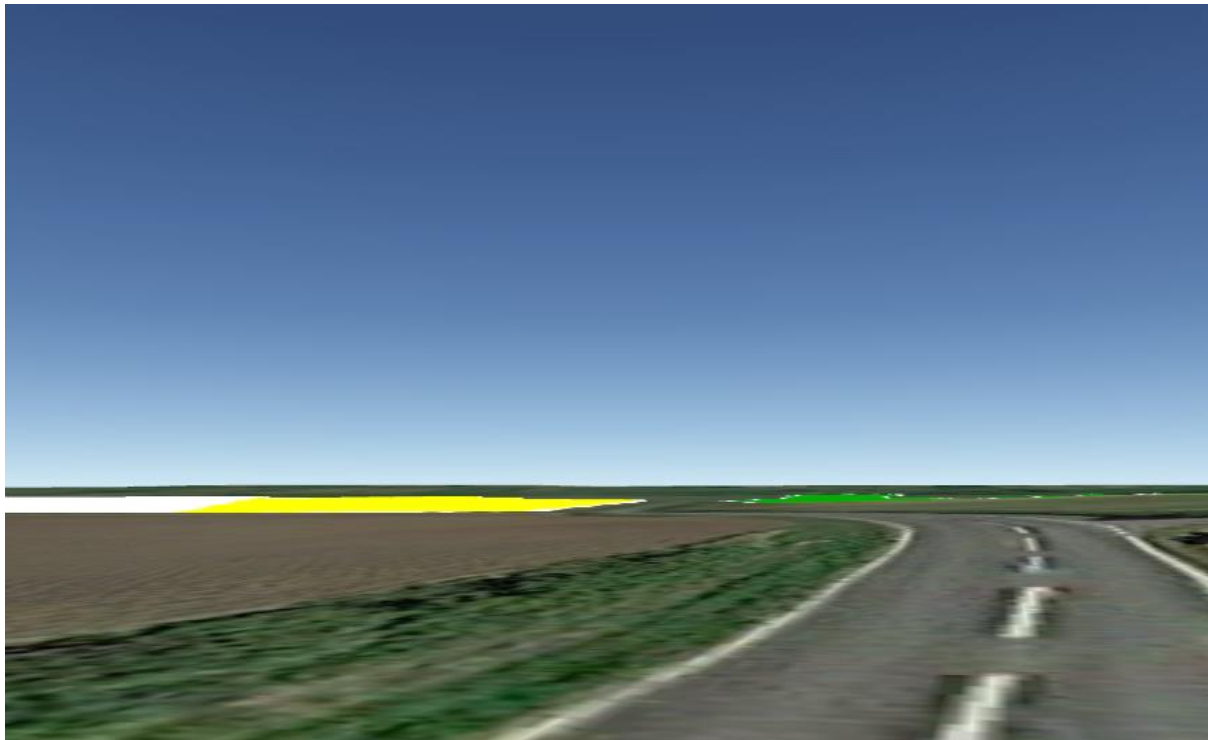
East Facing



West Facing



Receptor 9

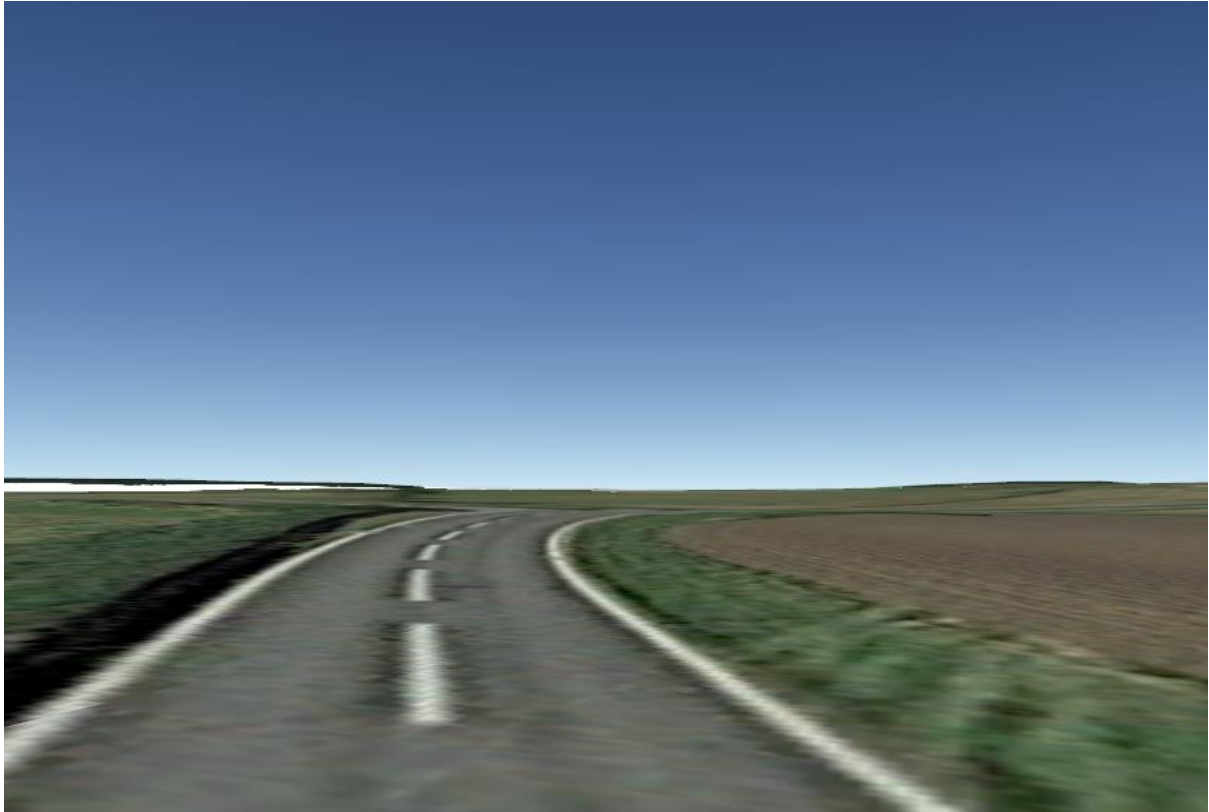


Receptor 10

East Facing

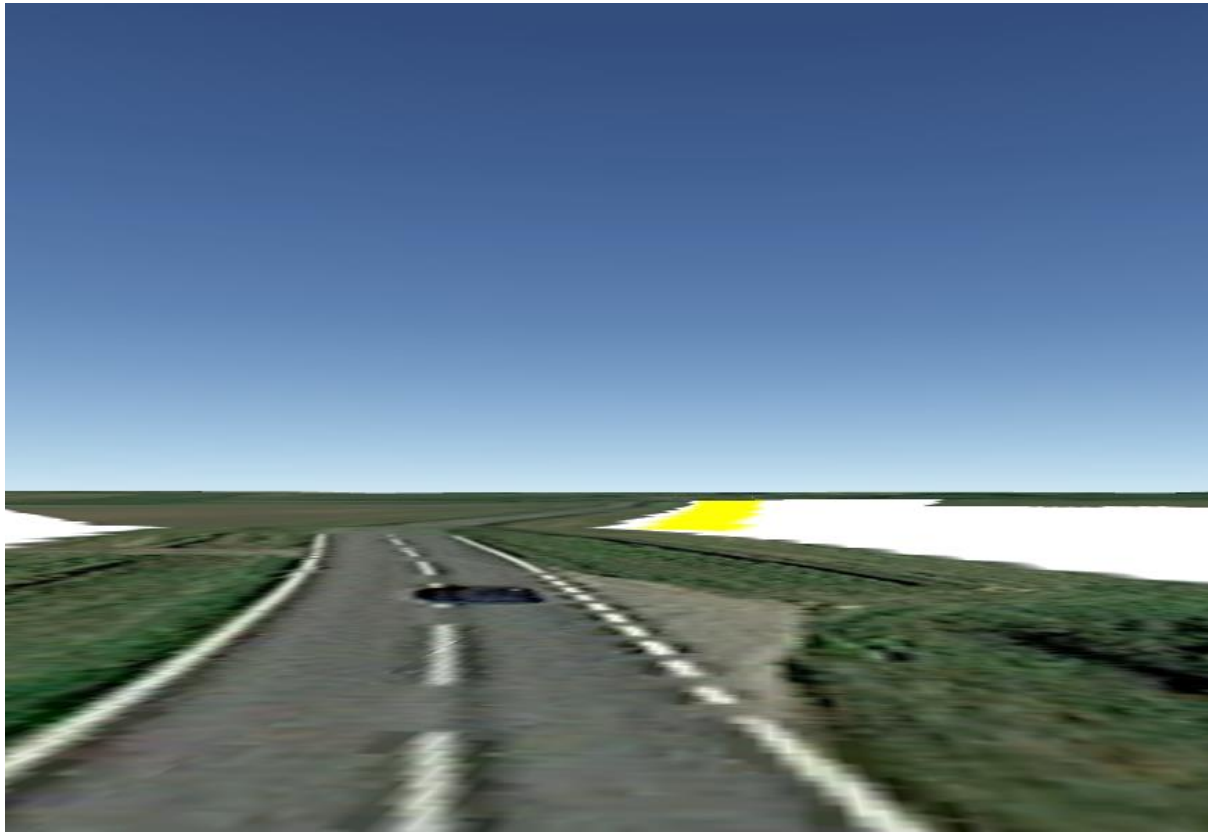


West Facing



Receptor 11

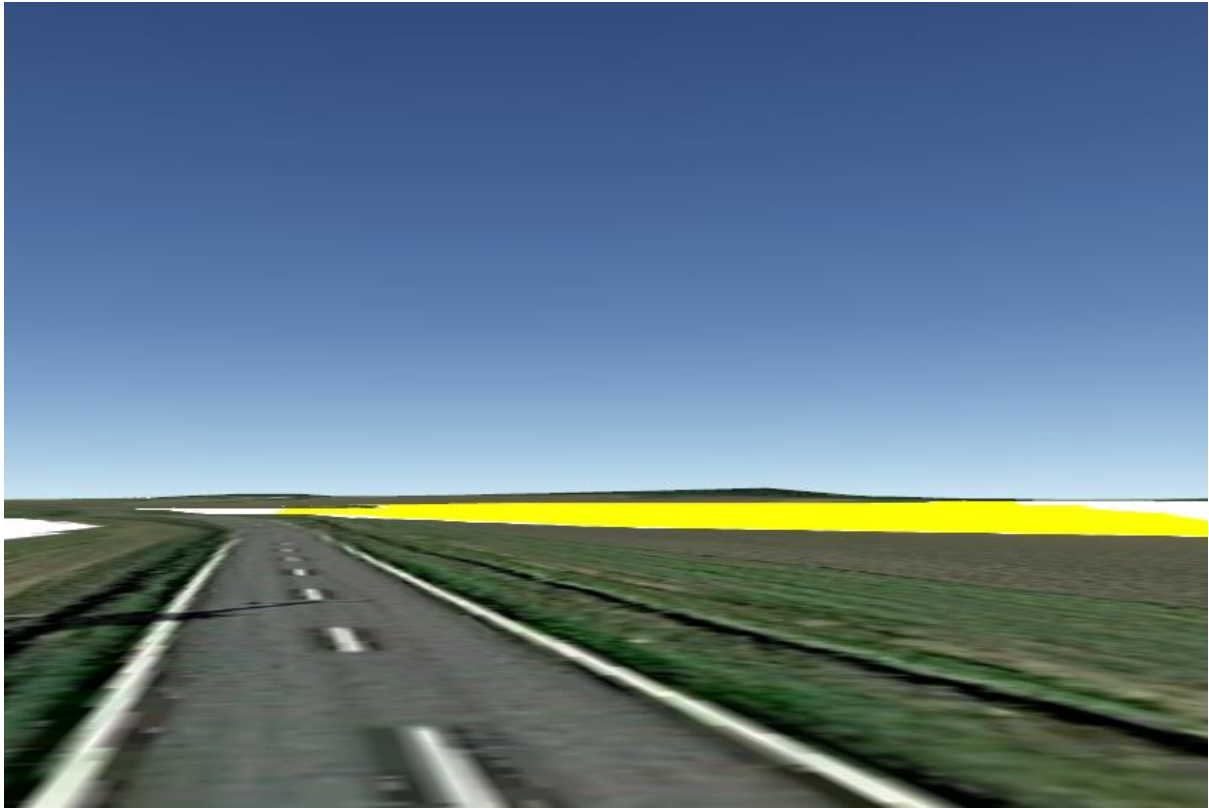
East Facing



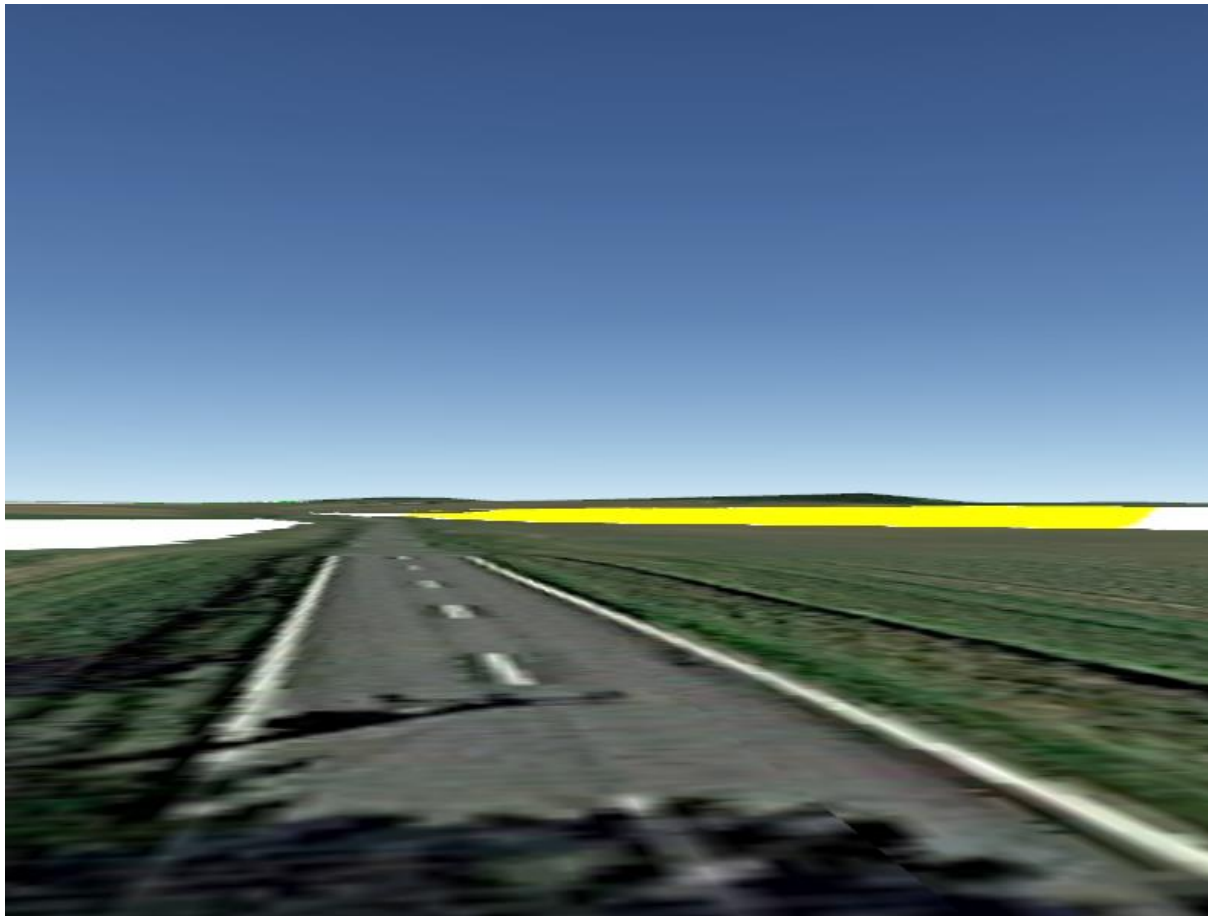
West Facing



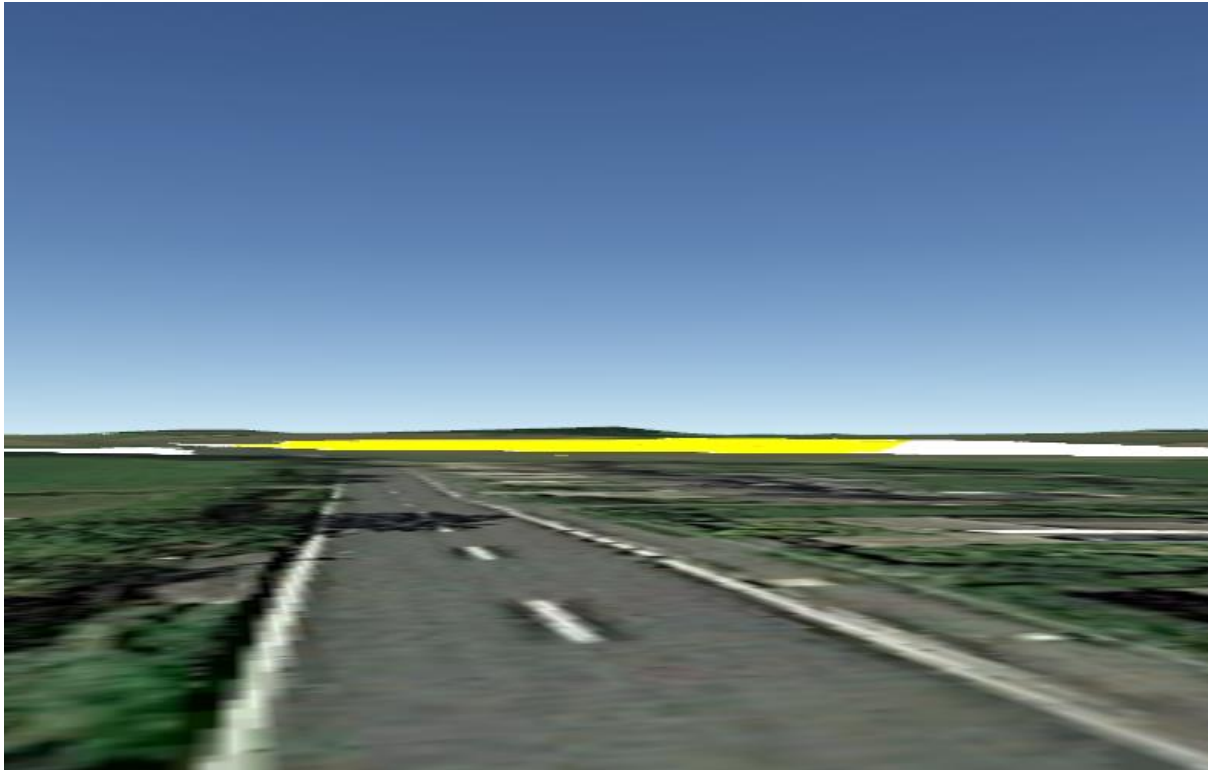
Receptor 12



Receptor 13



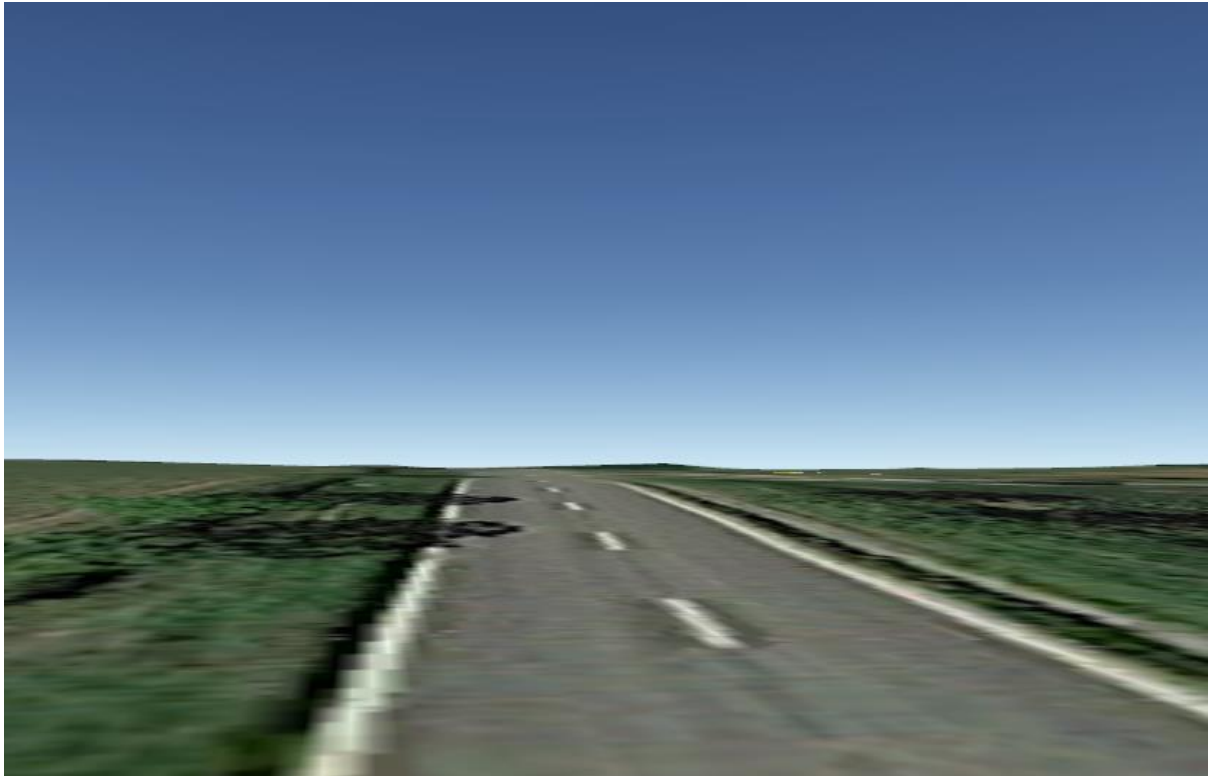
Receptor 14



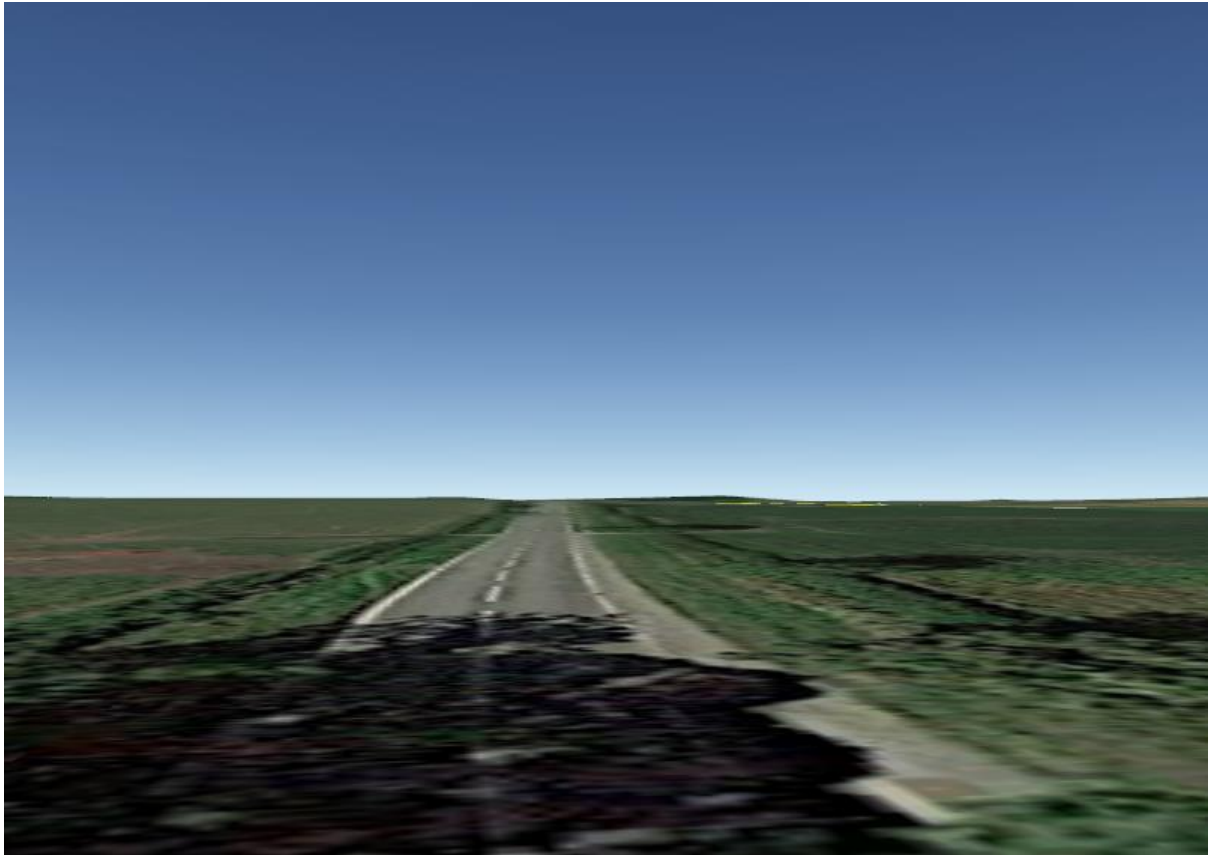
Receptor 15



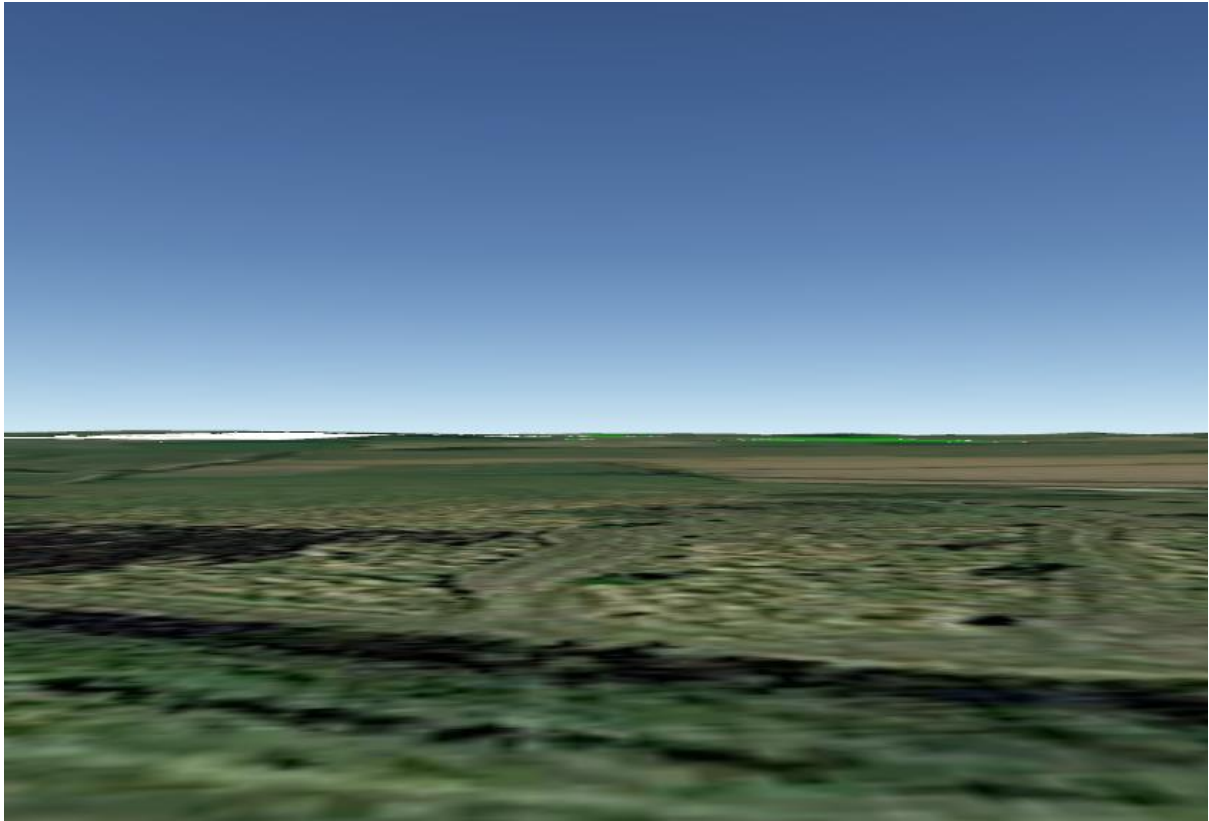
Receptor 16



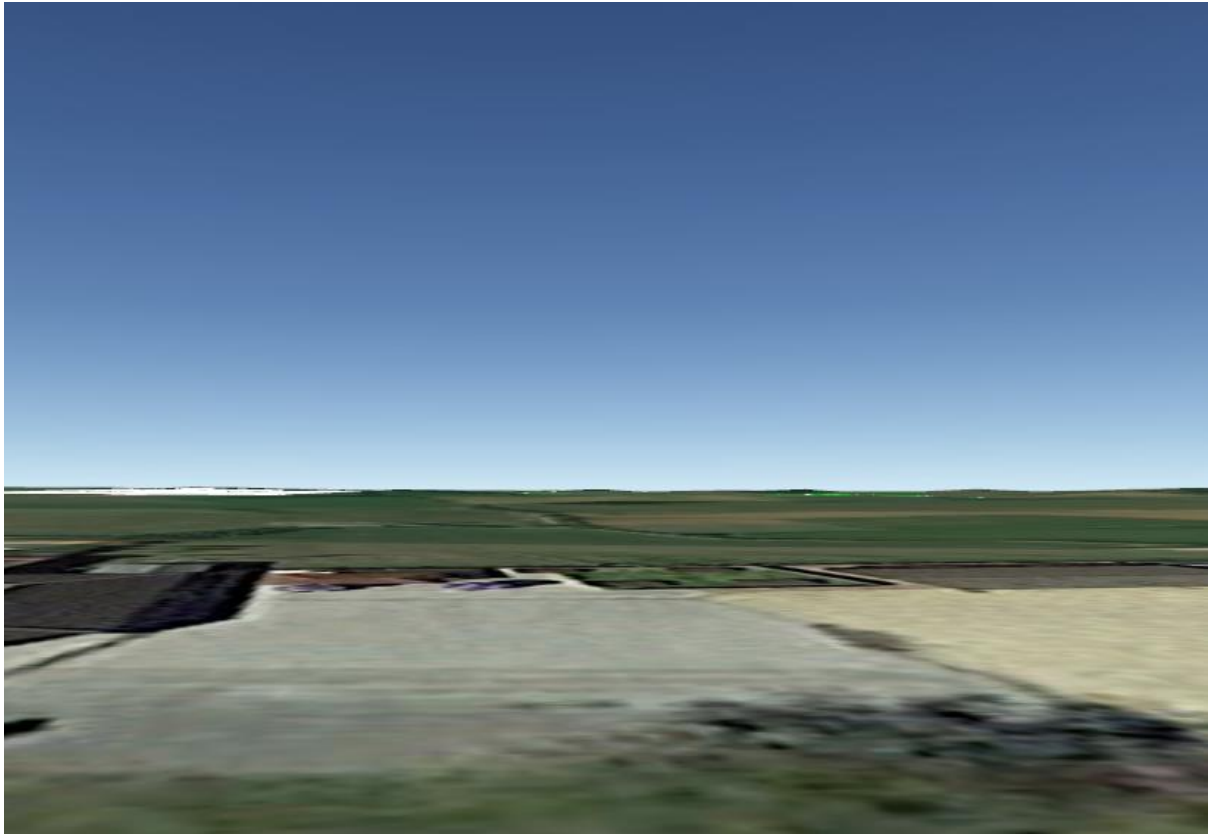
Receptor 17



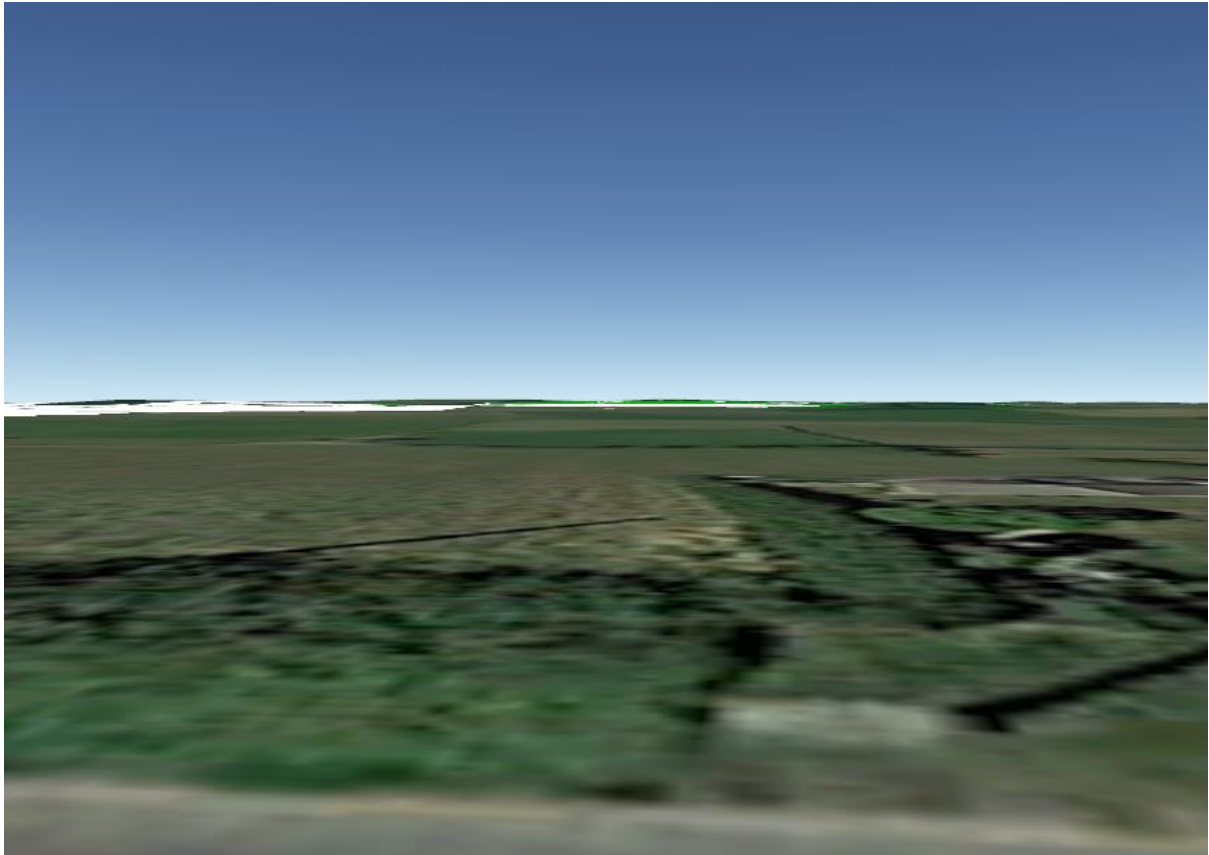
Receptor 18



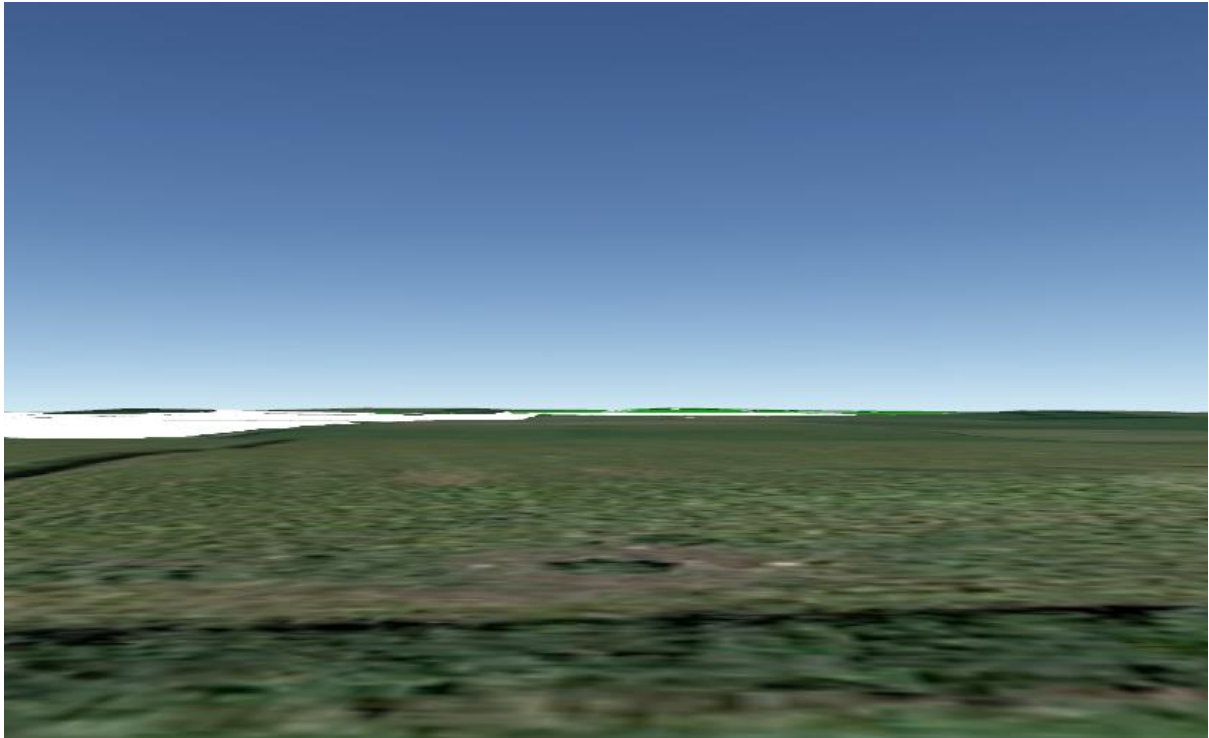
Receptor 19



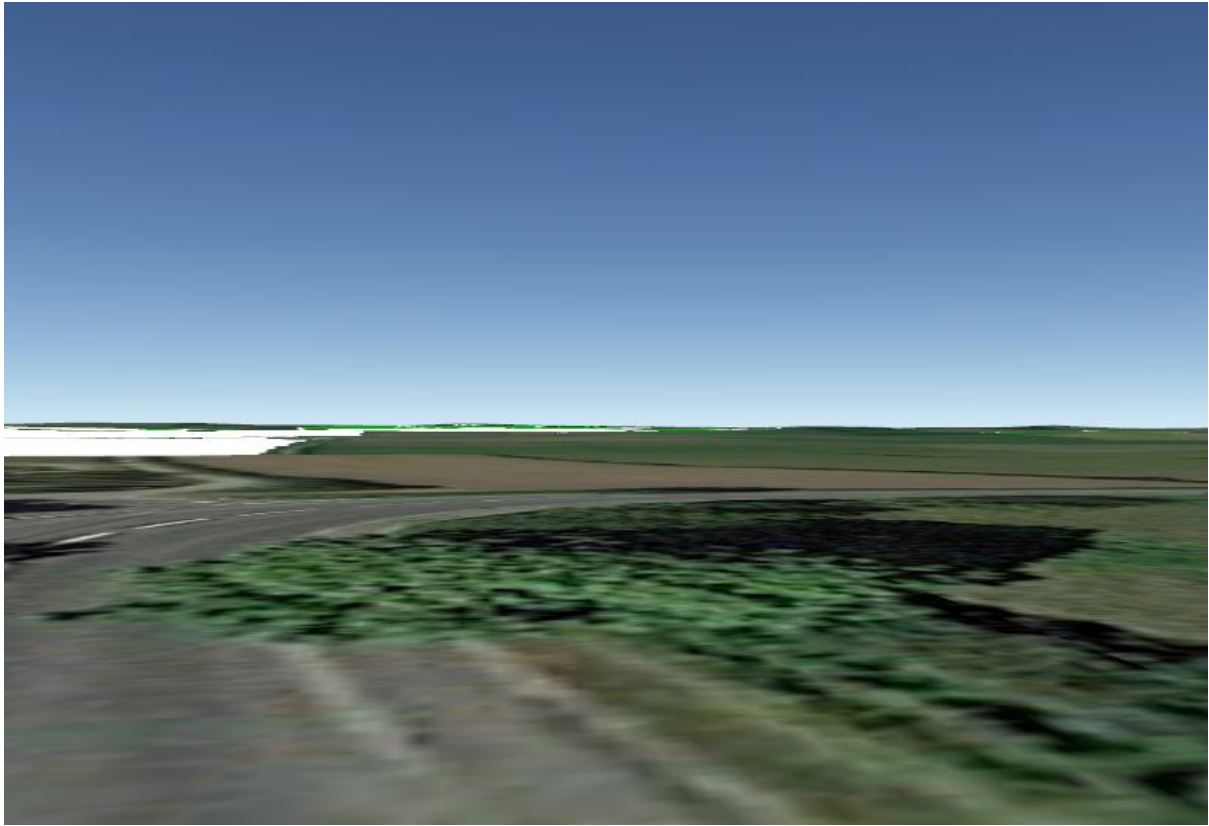
Receptor 20



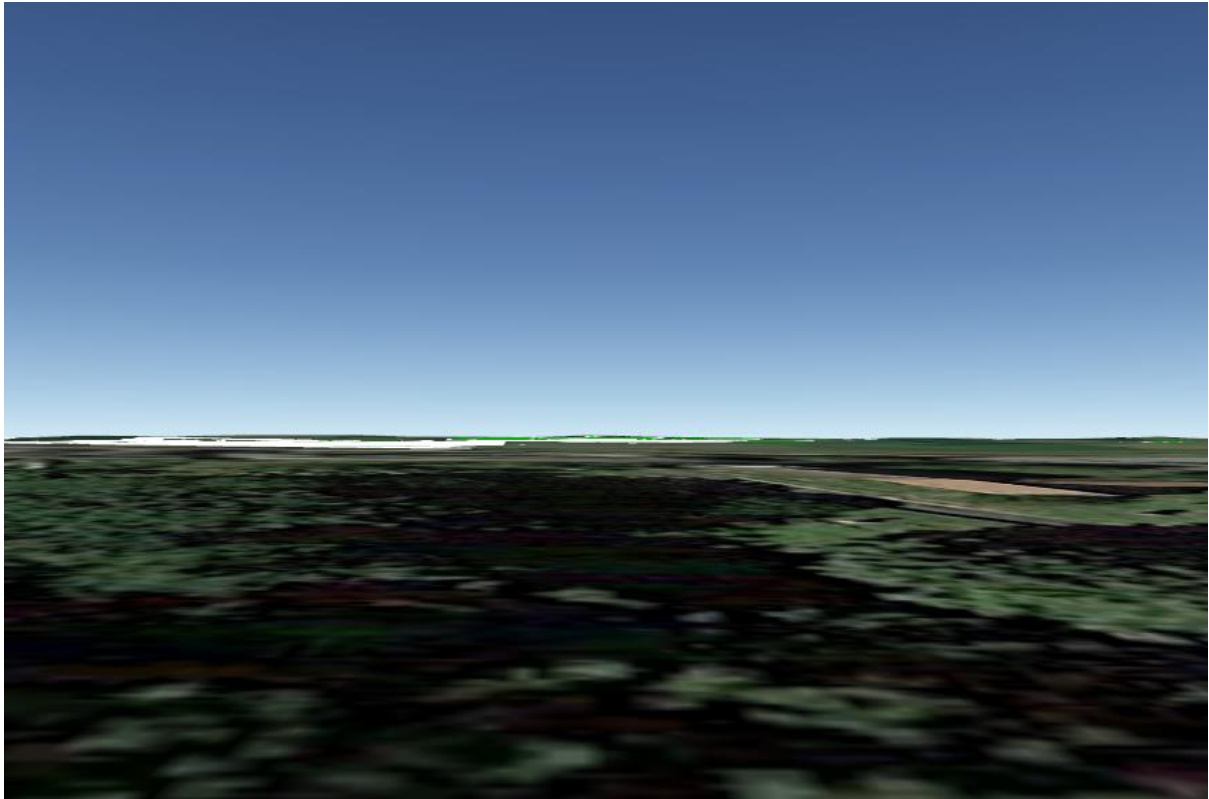
Receptor 21



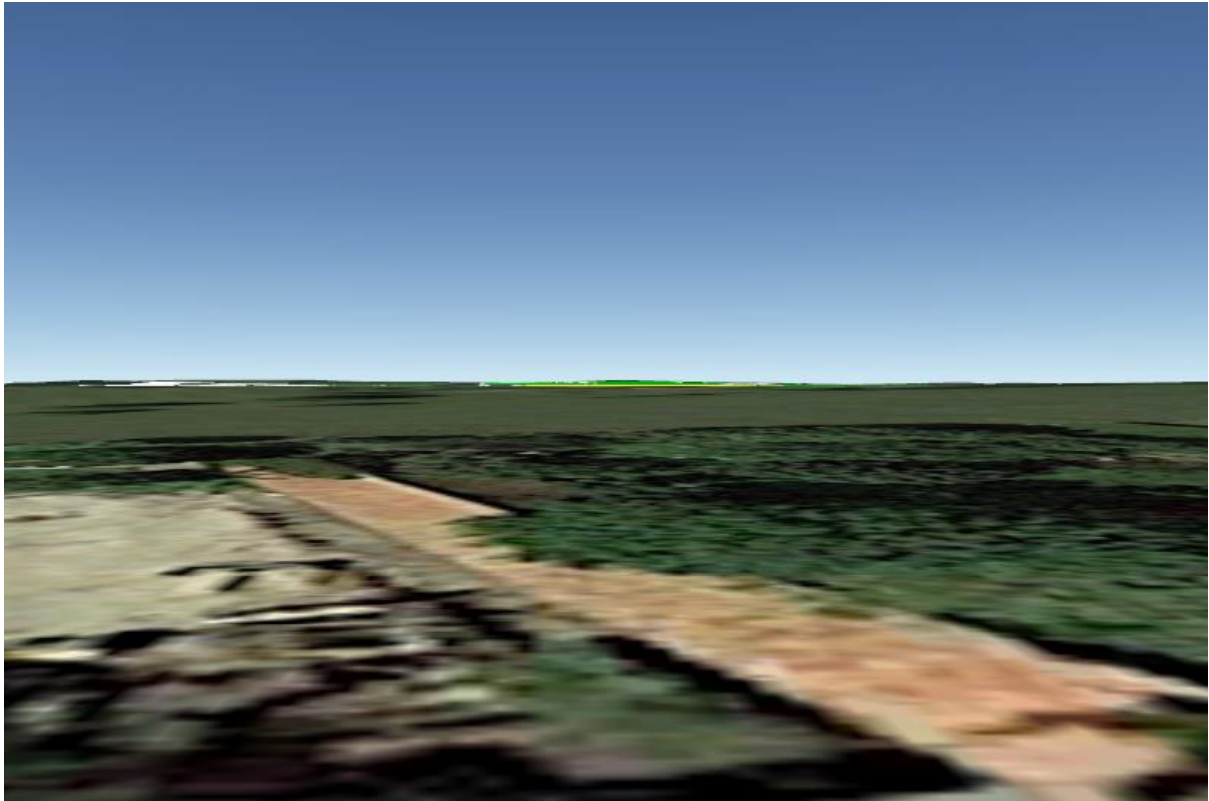
Receptor 22



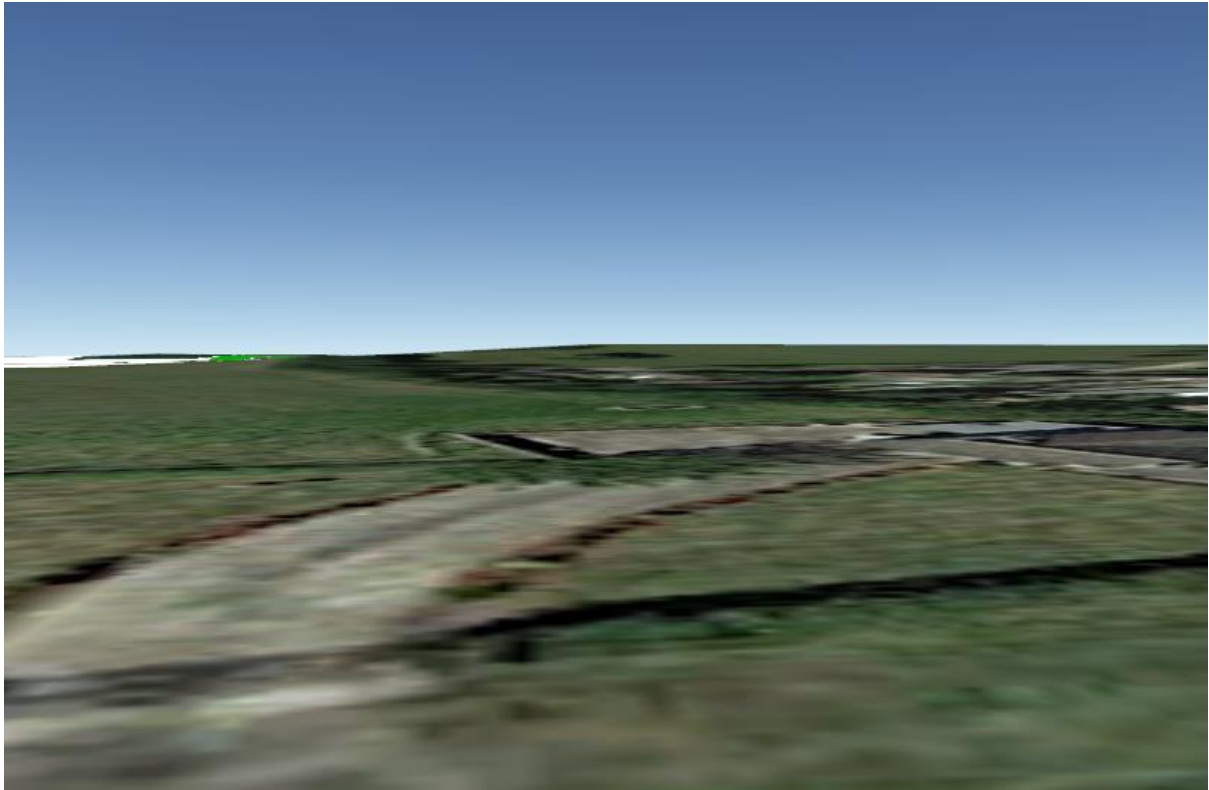
Receptor 23



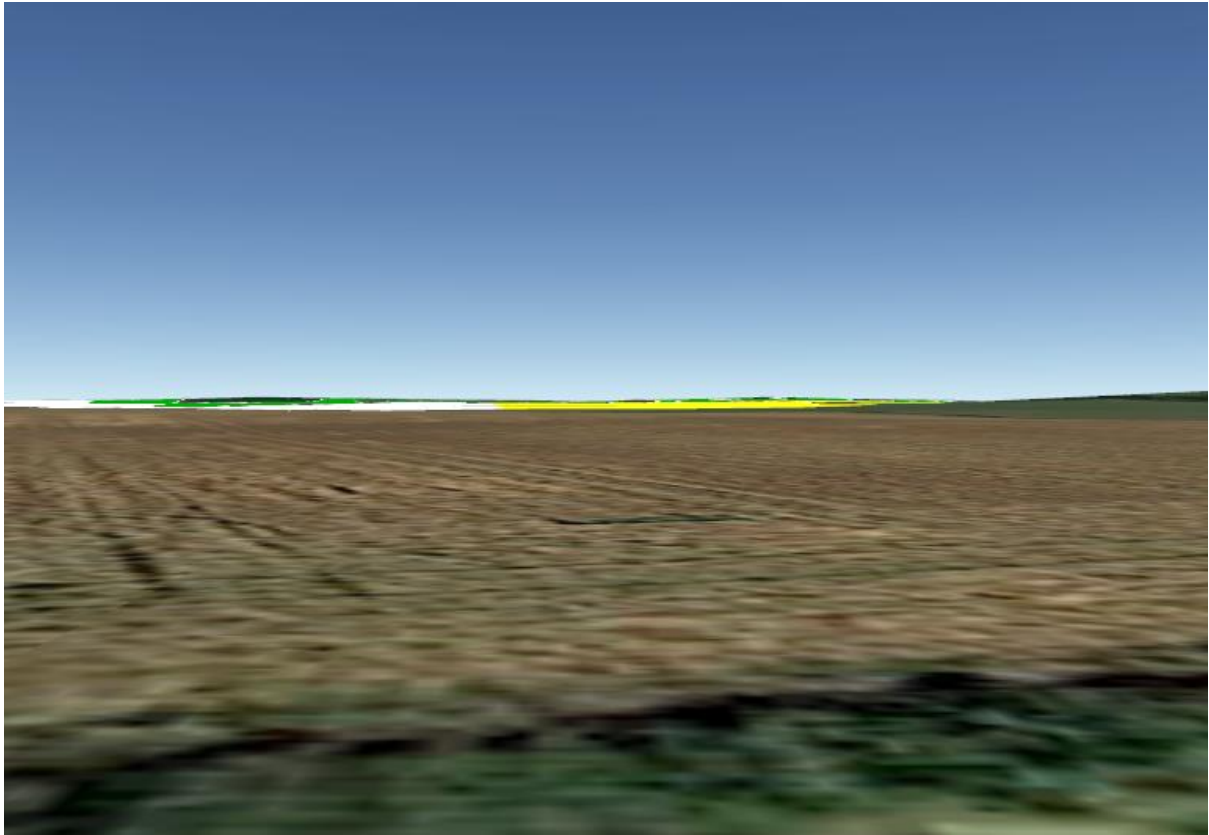
Receptor 24



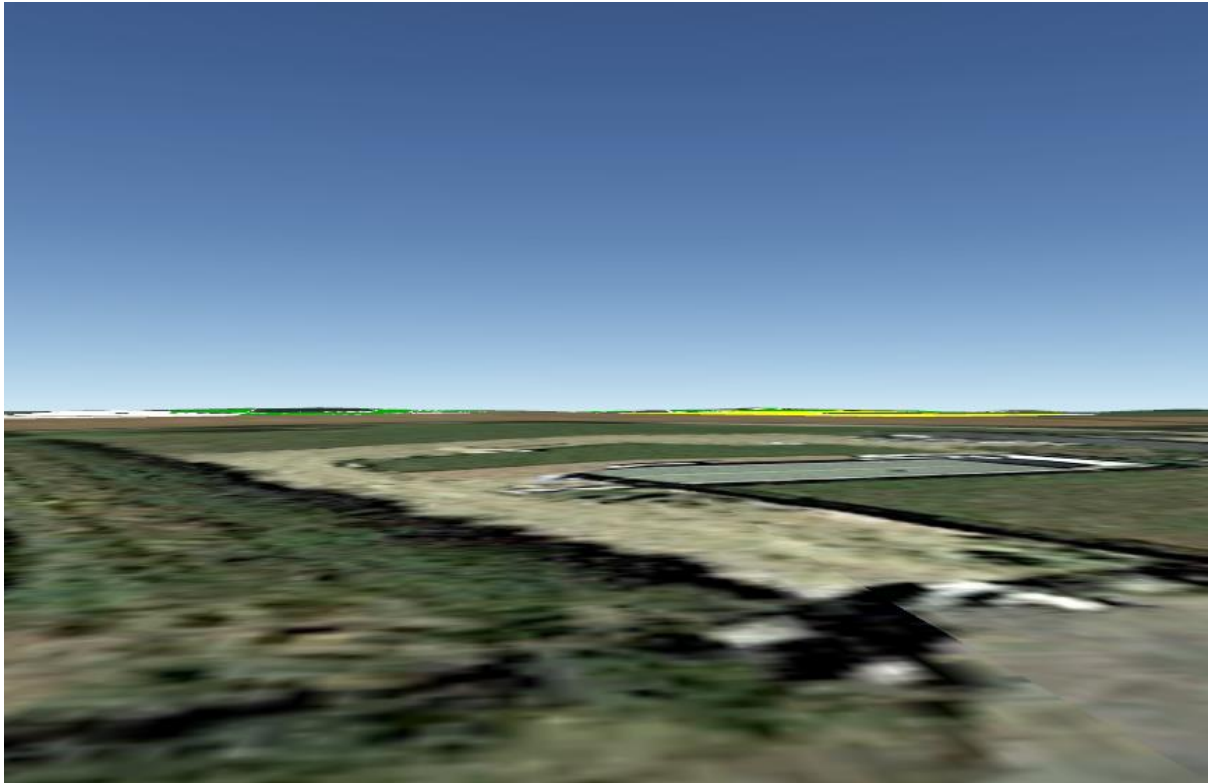
Receptor 25



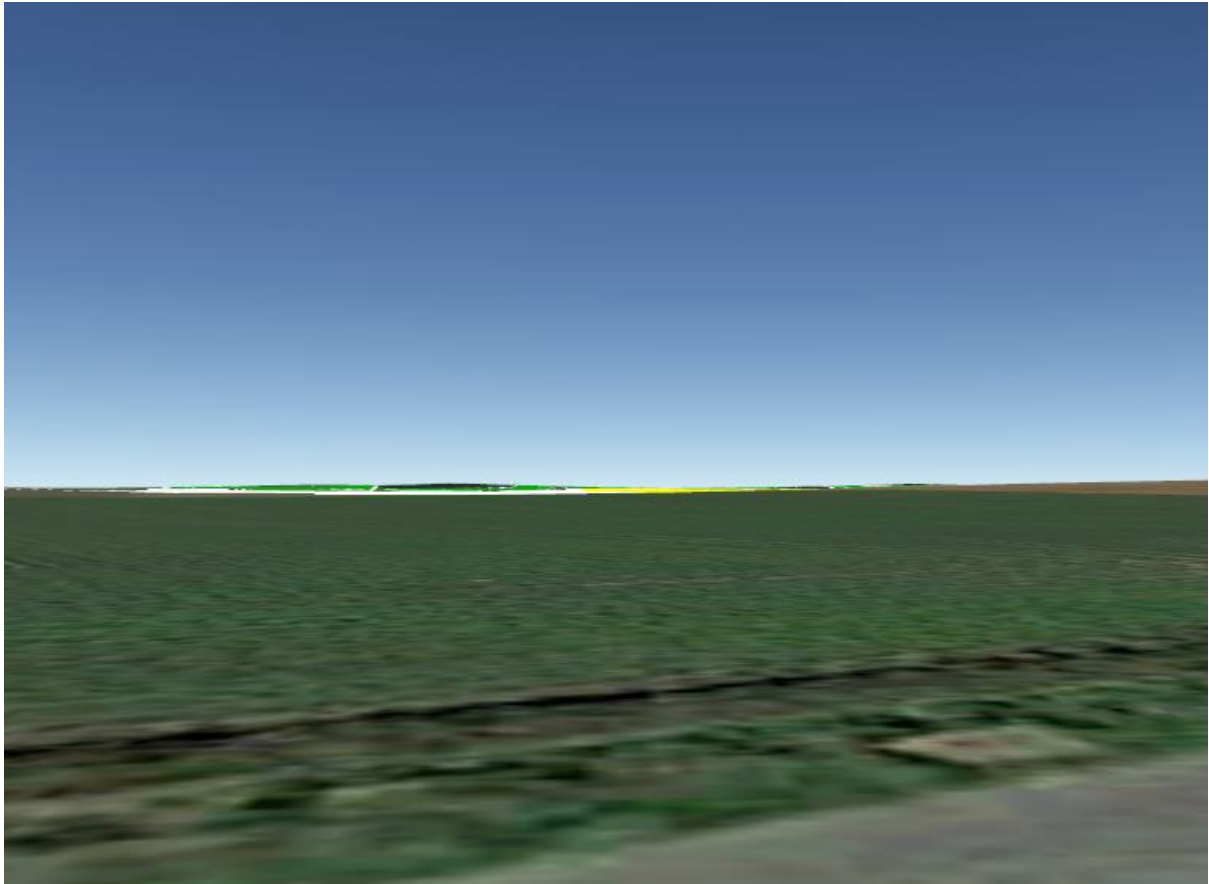
Receptor 26



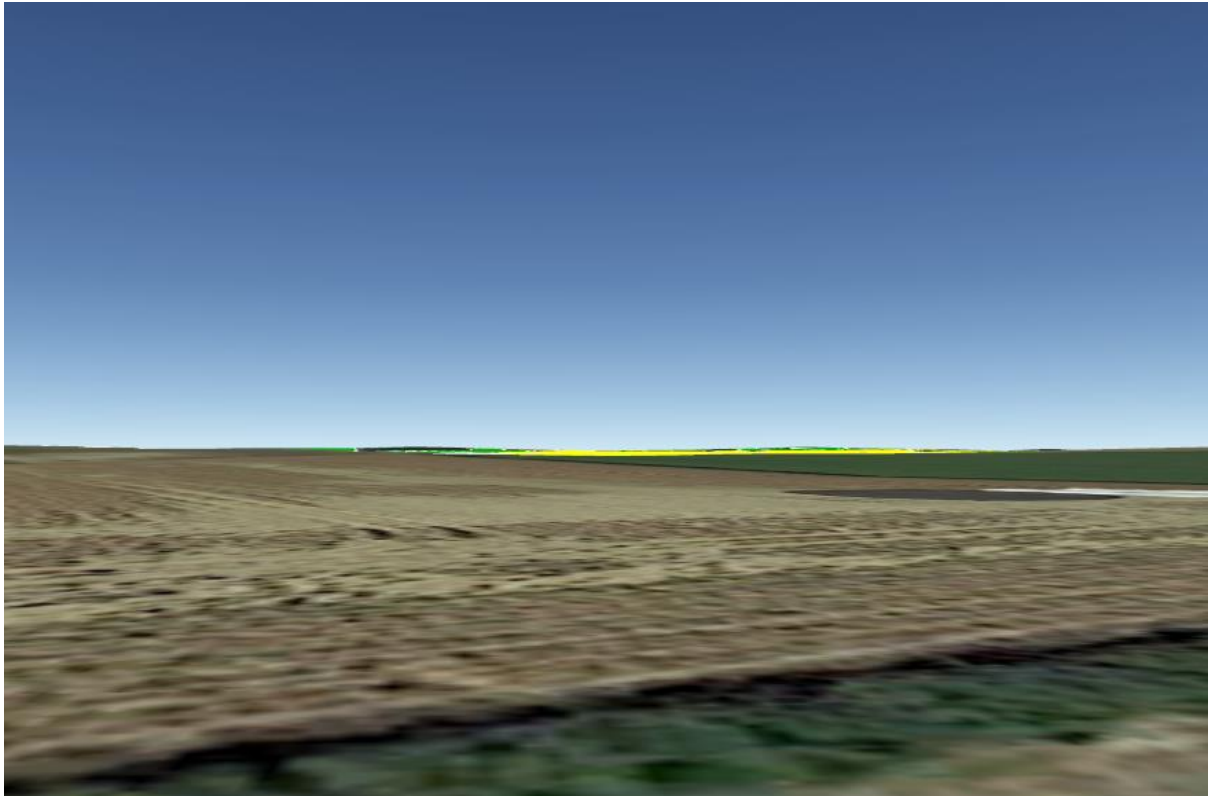
Receptor 27



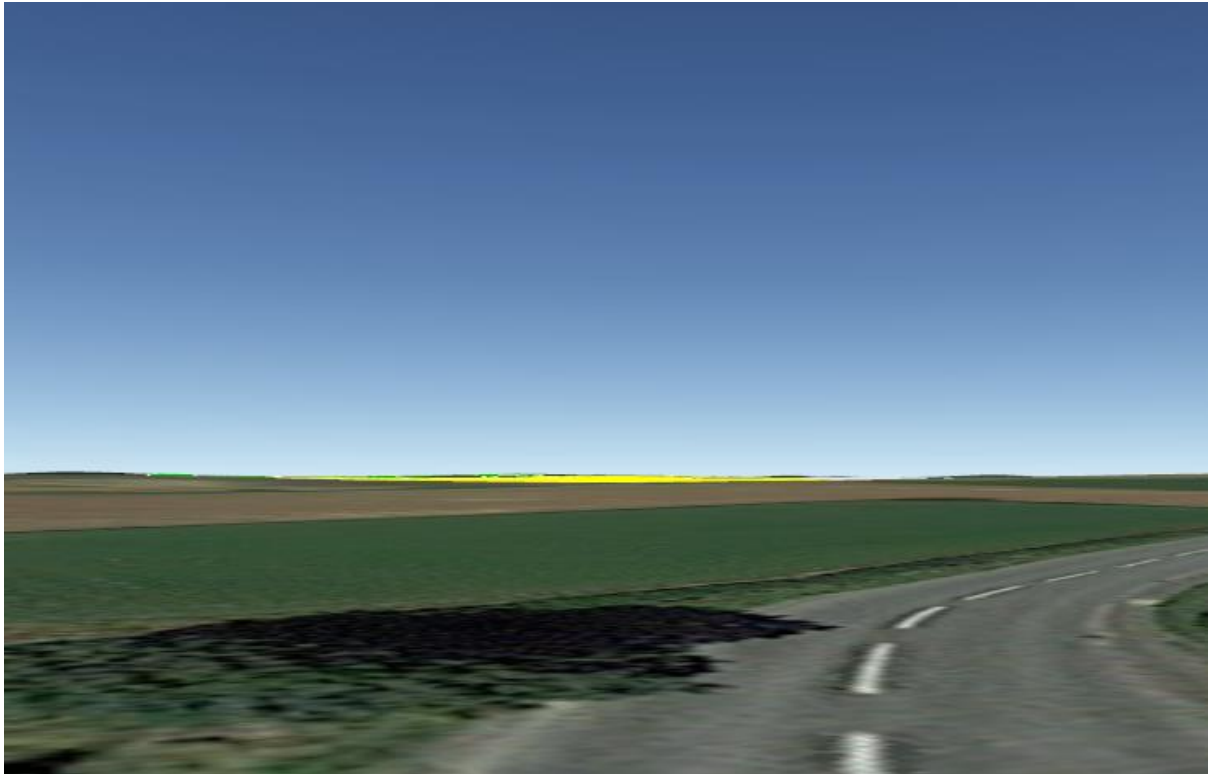
Receptor 28



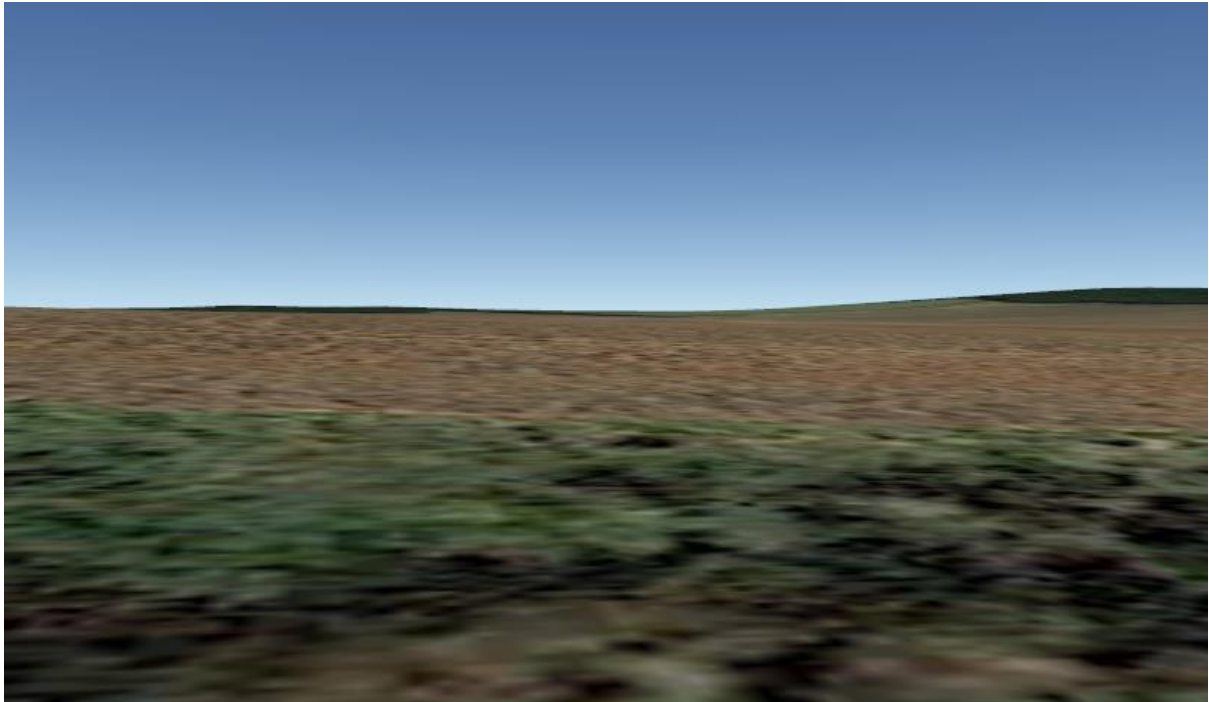
Receptor 29



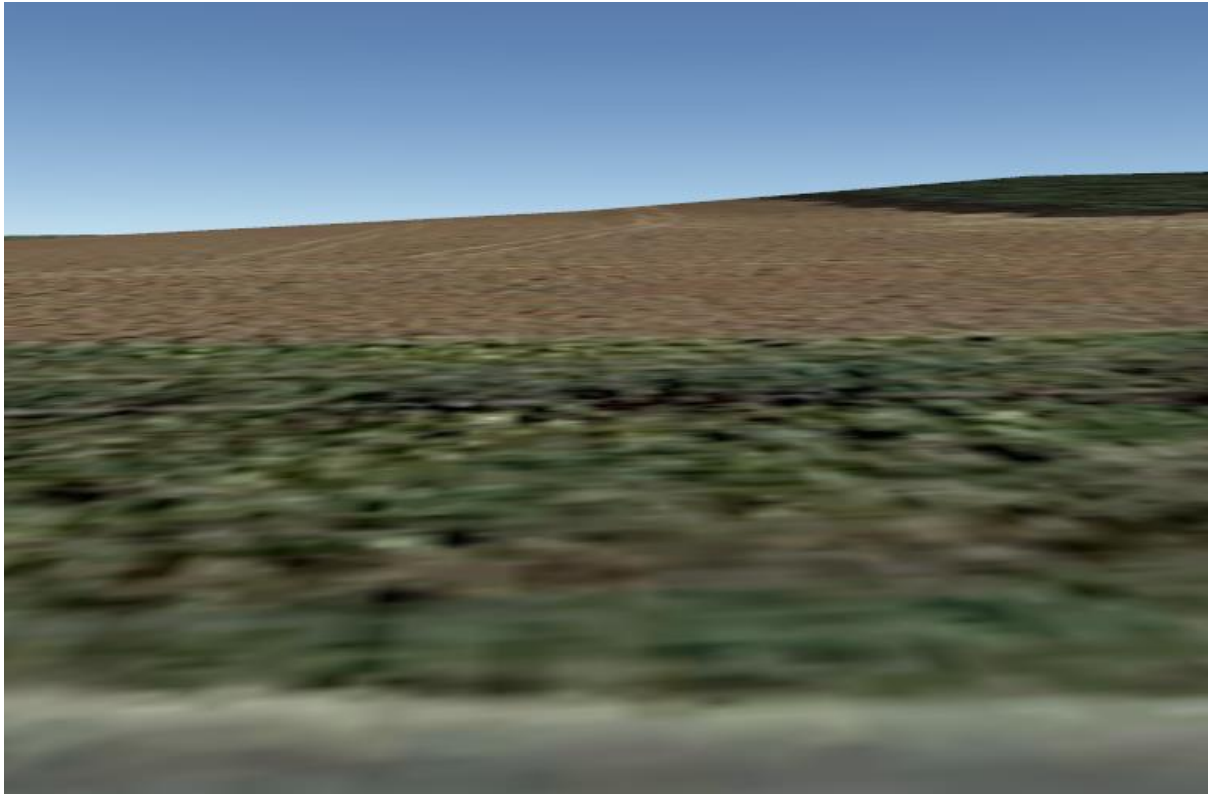
Receptor 30



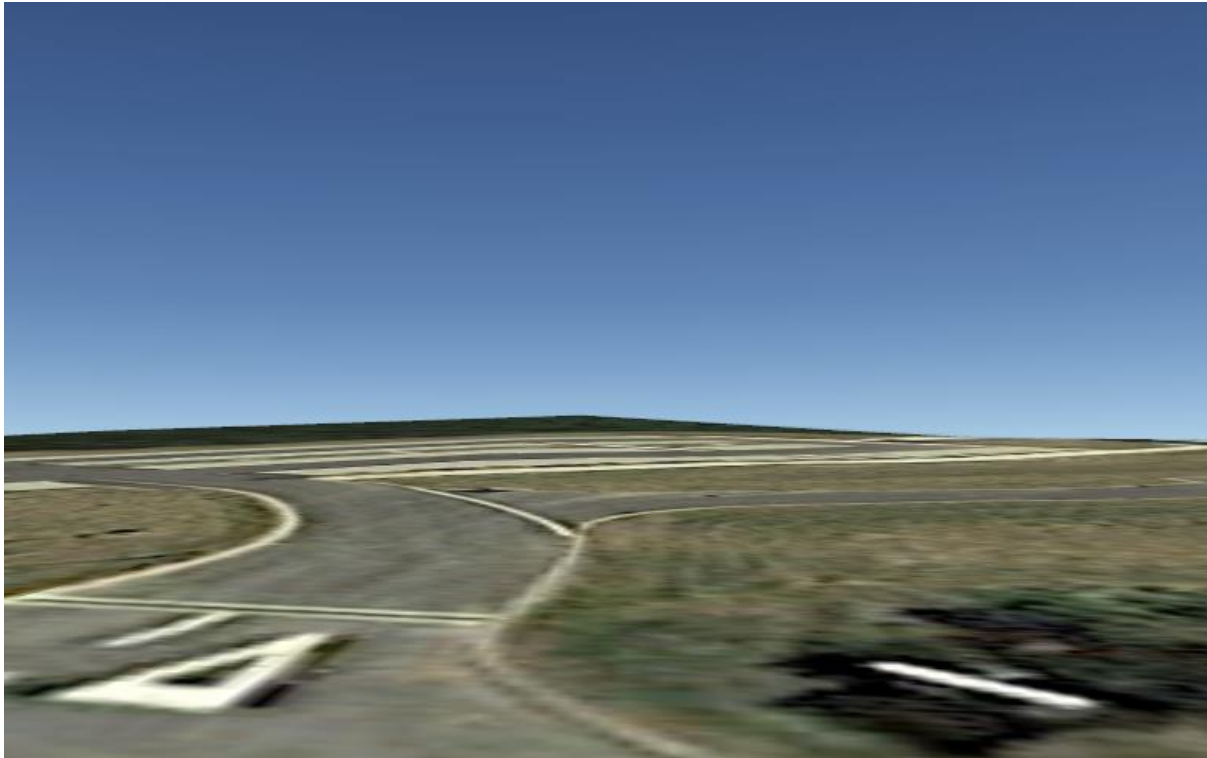
Receptor 31



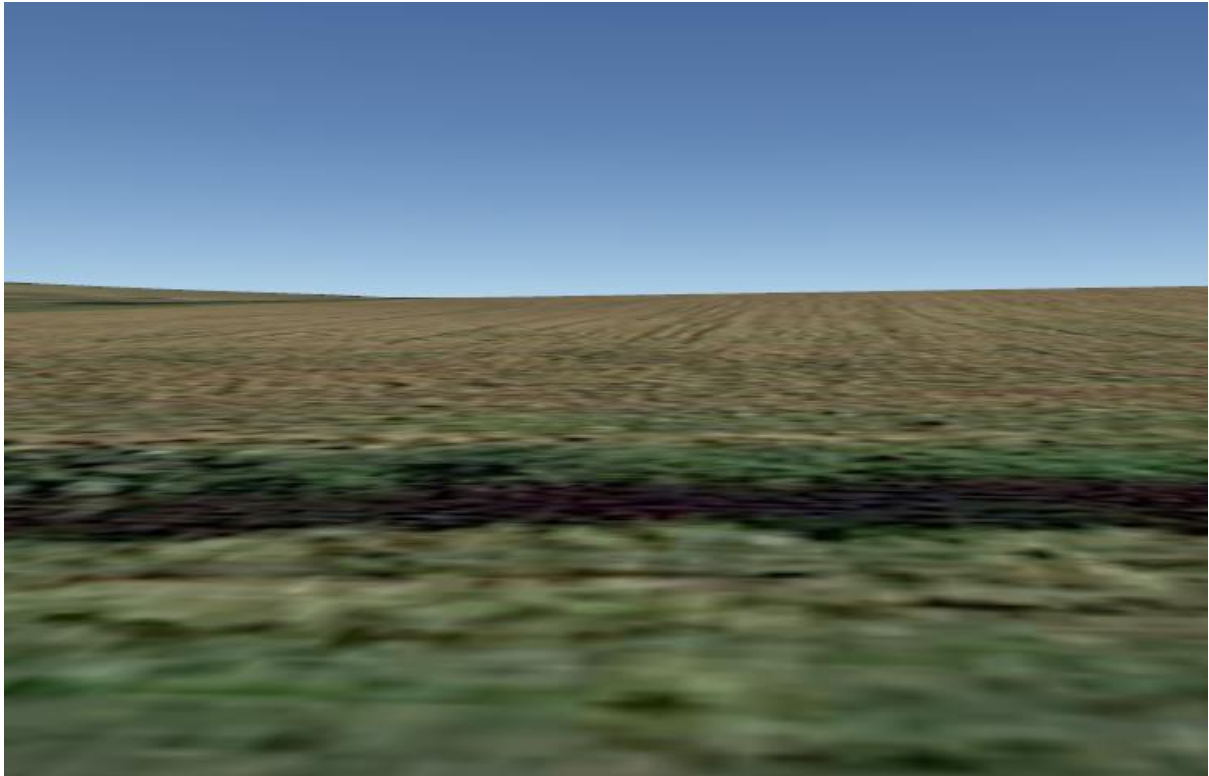
Receptor 32



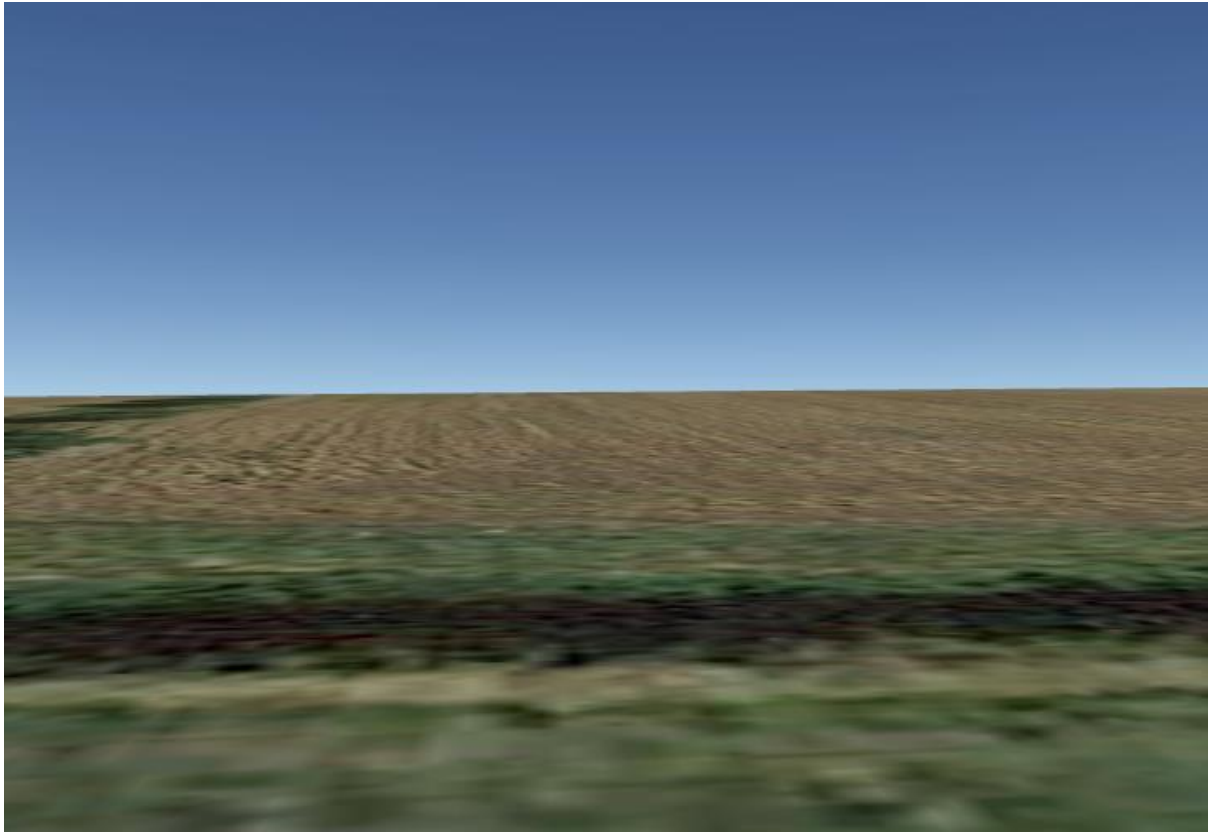
Receptor 33



Receptor 34



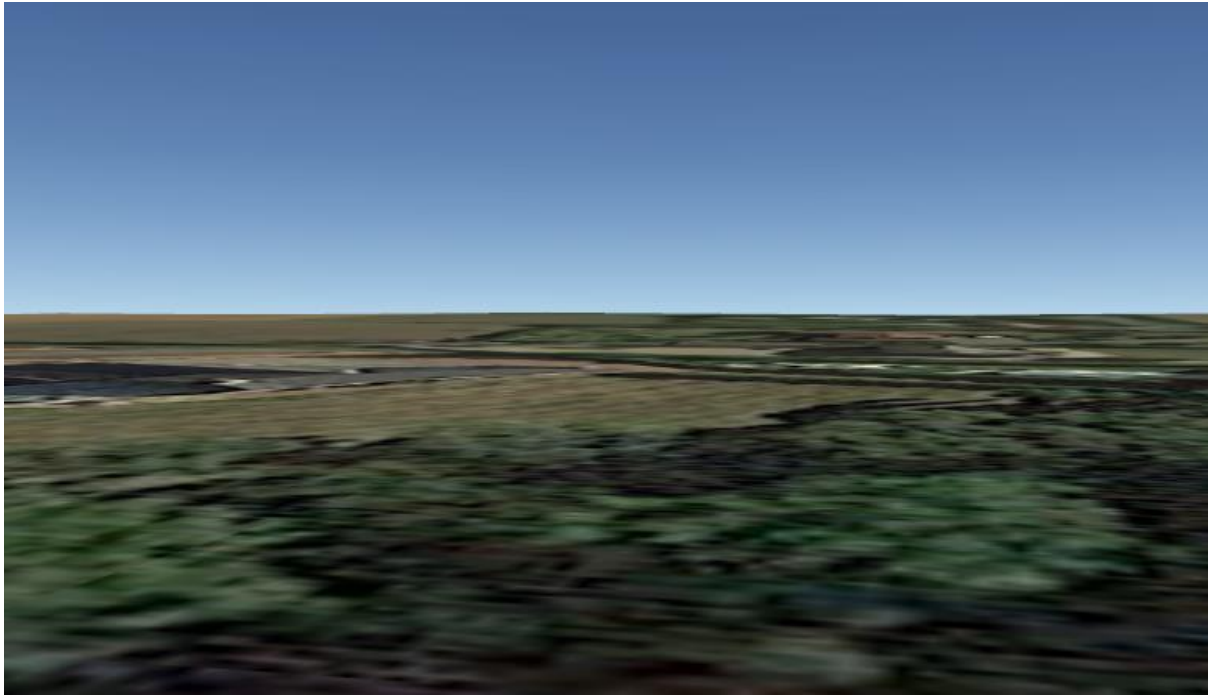
Receptor 35



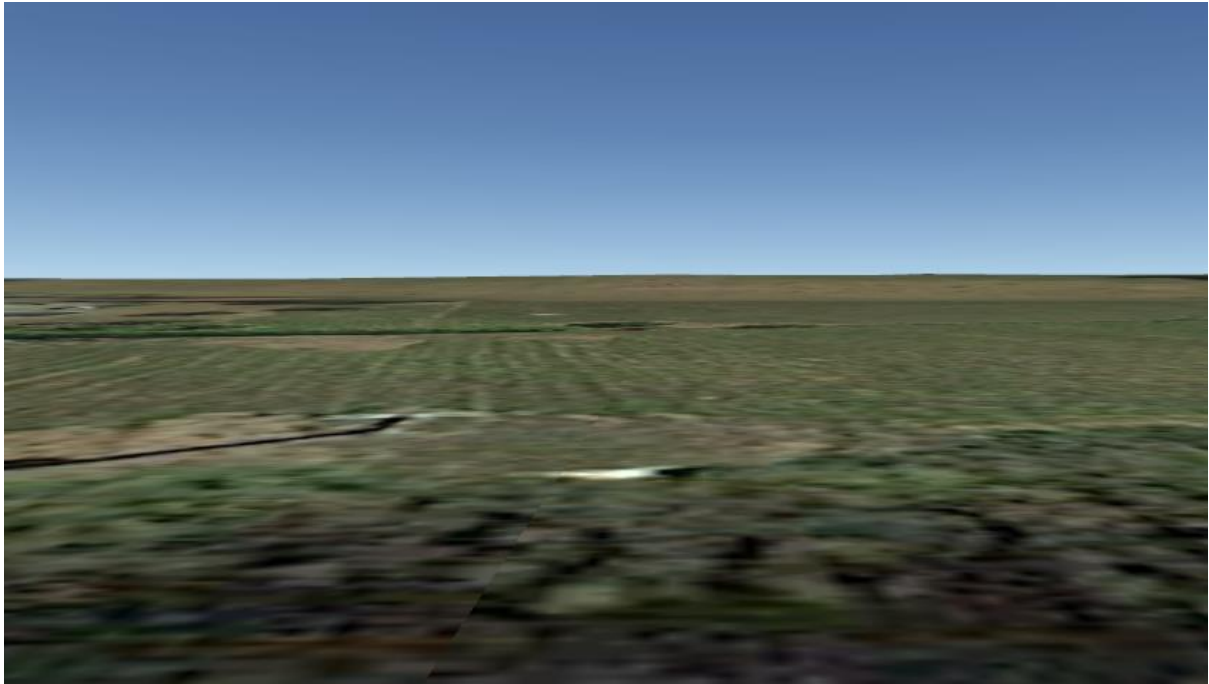
Receptor 36



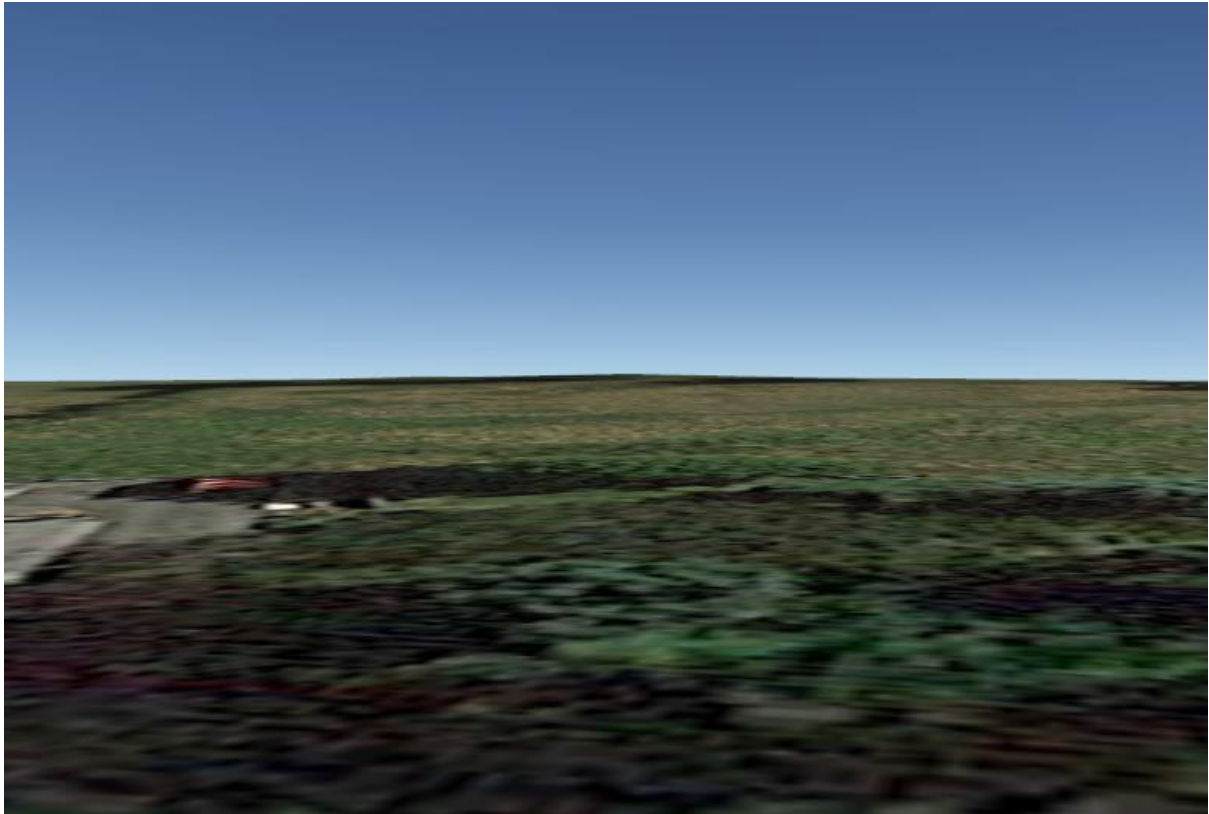
Receptor 37



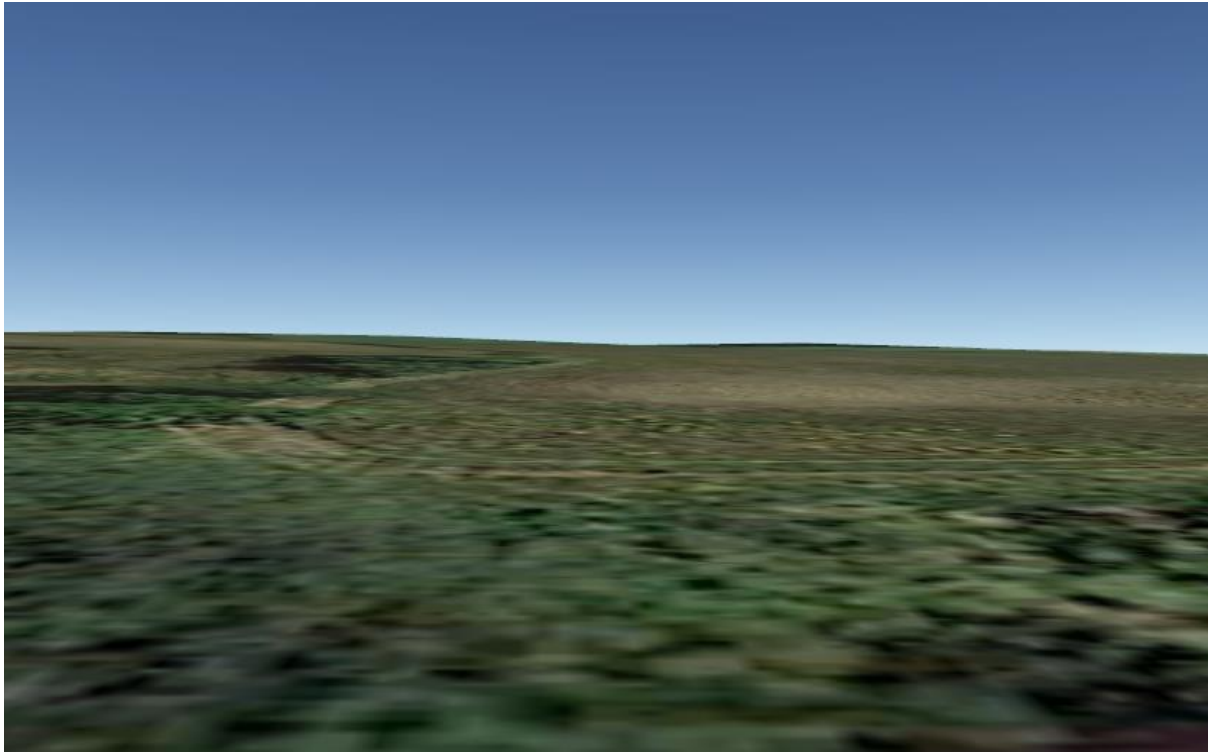
Receptor 38



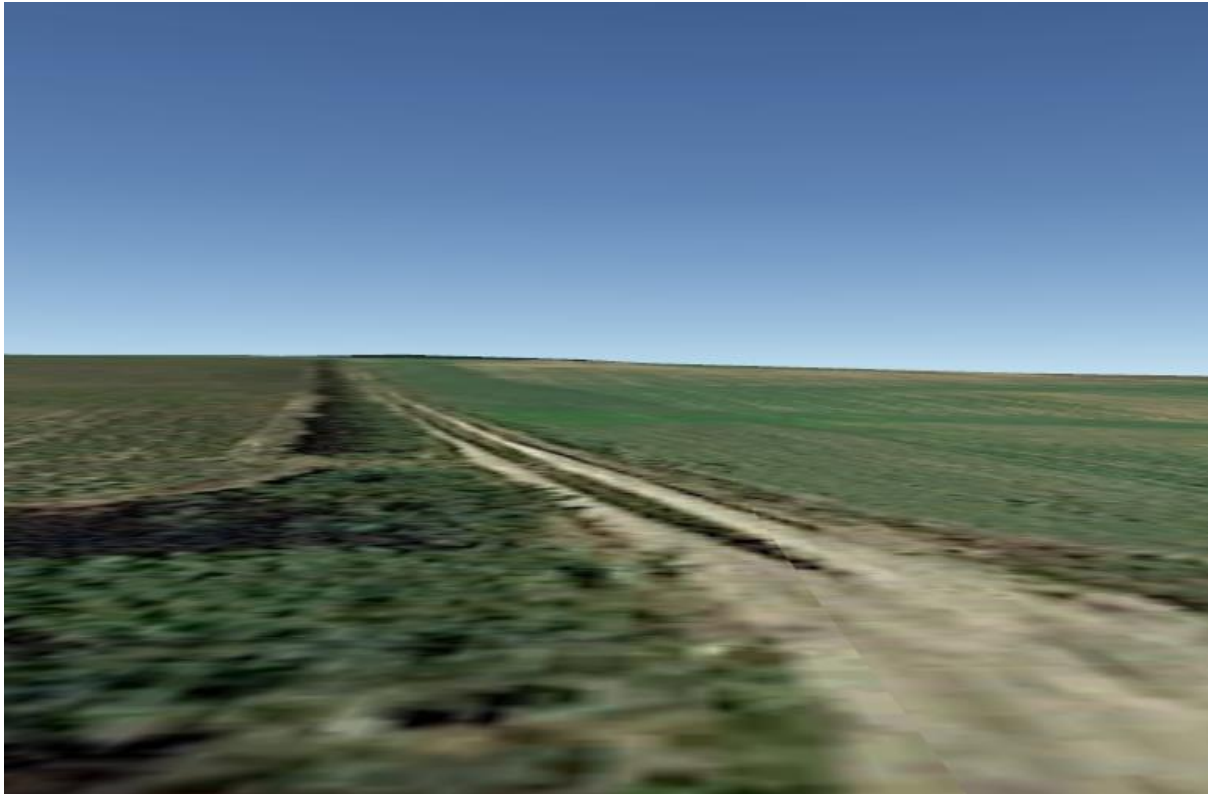
Receptor 39



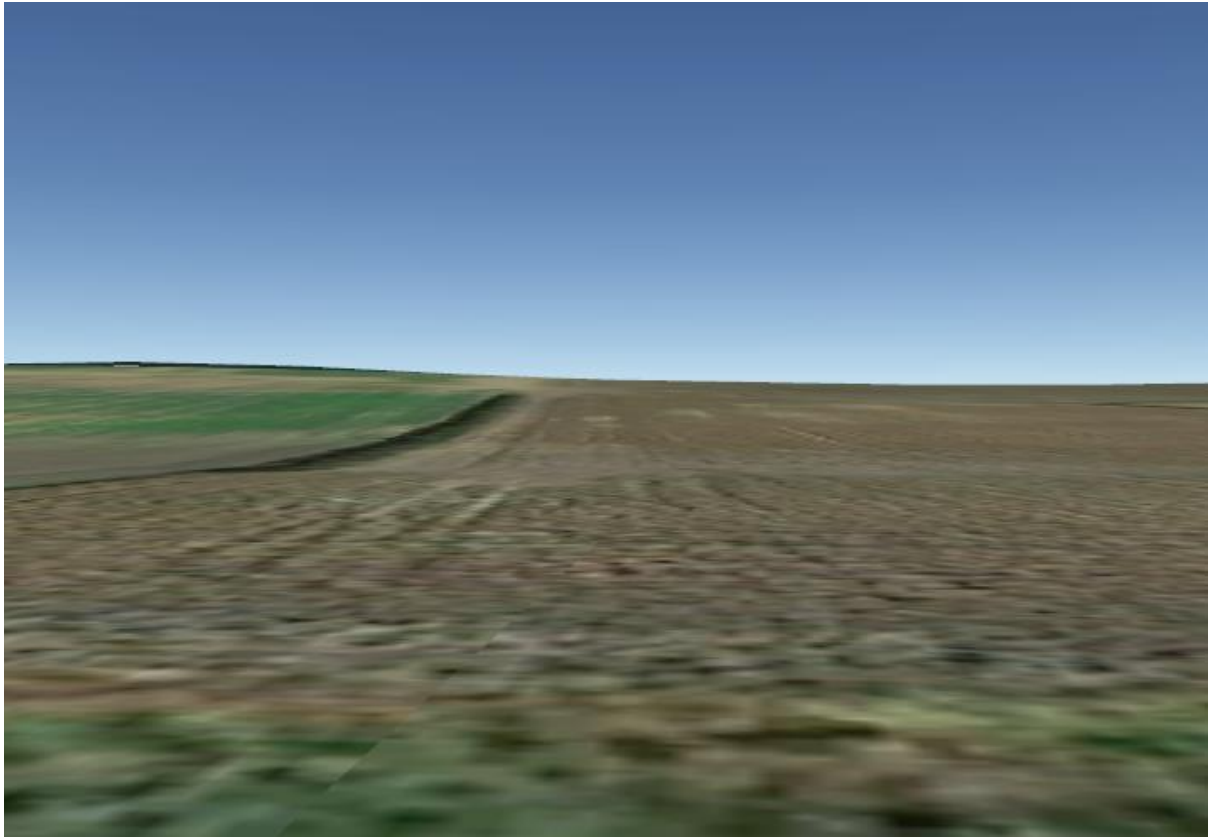
Receptor 40



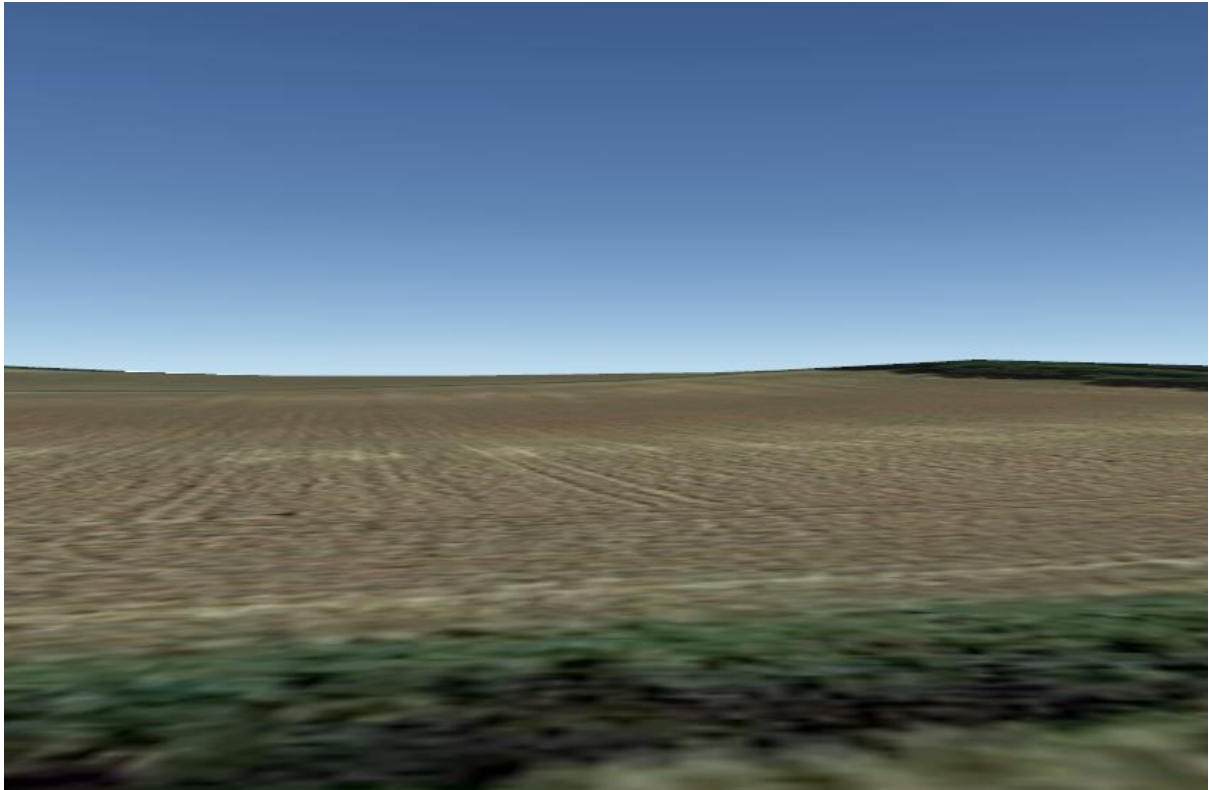
Receptor 41



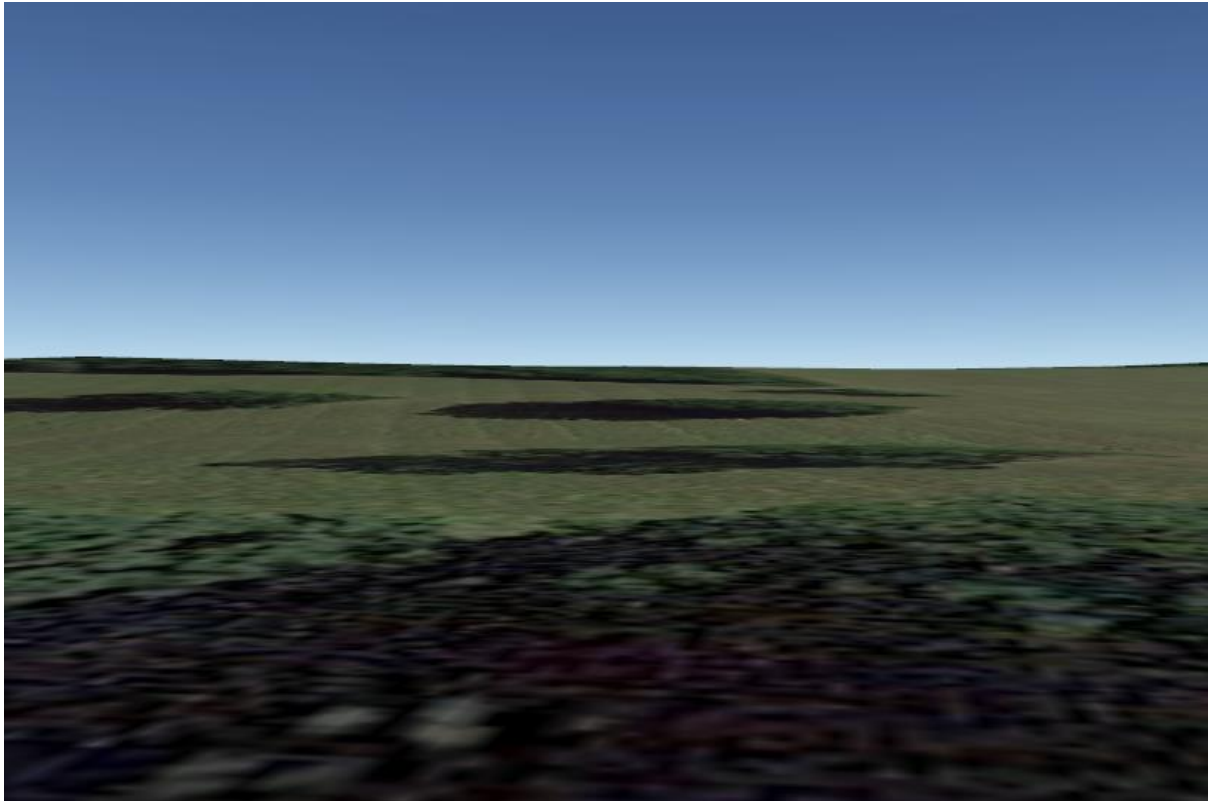
Receptor 42



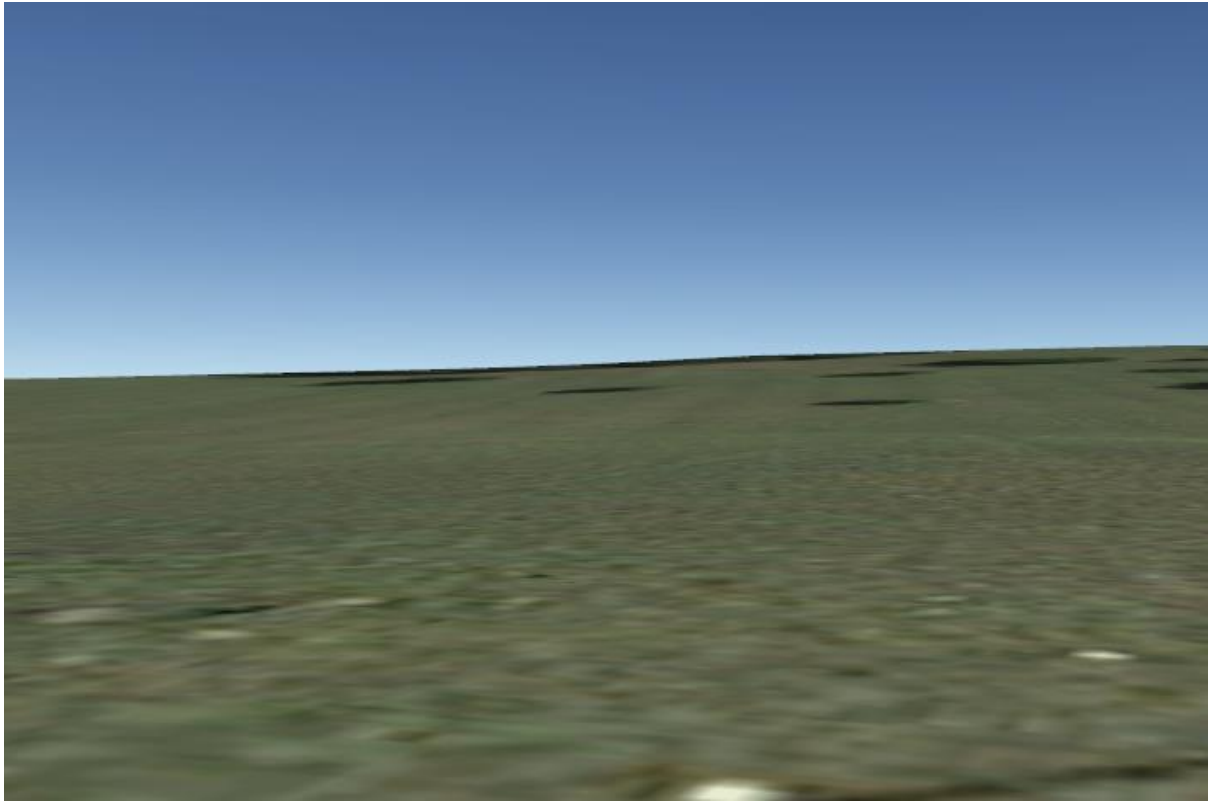
Receptor 43



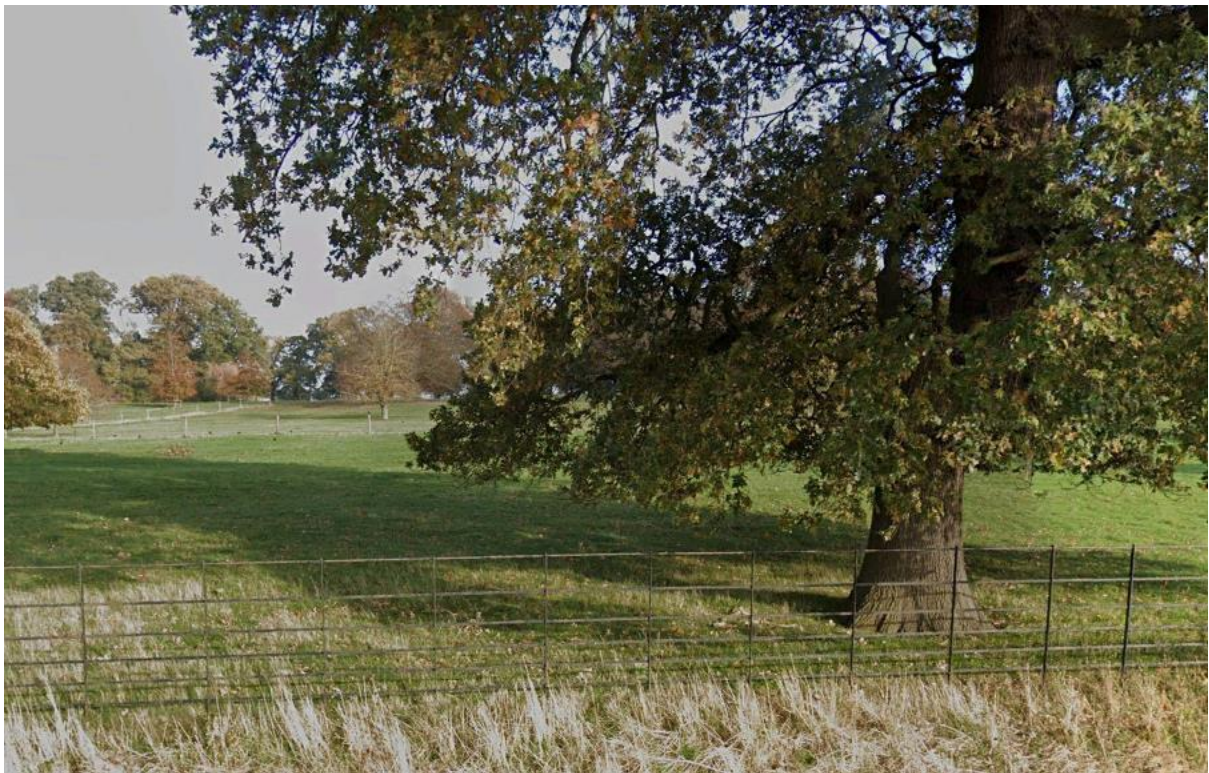
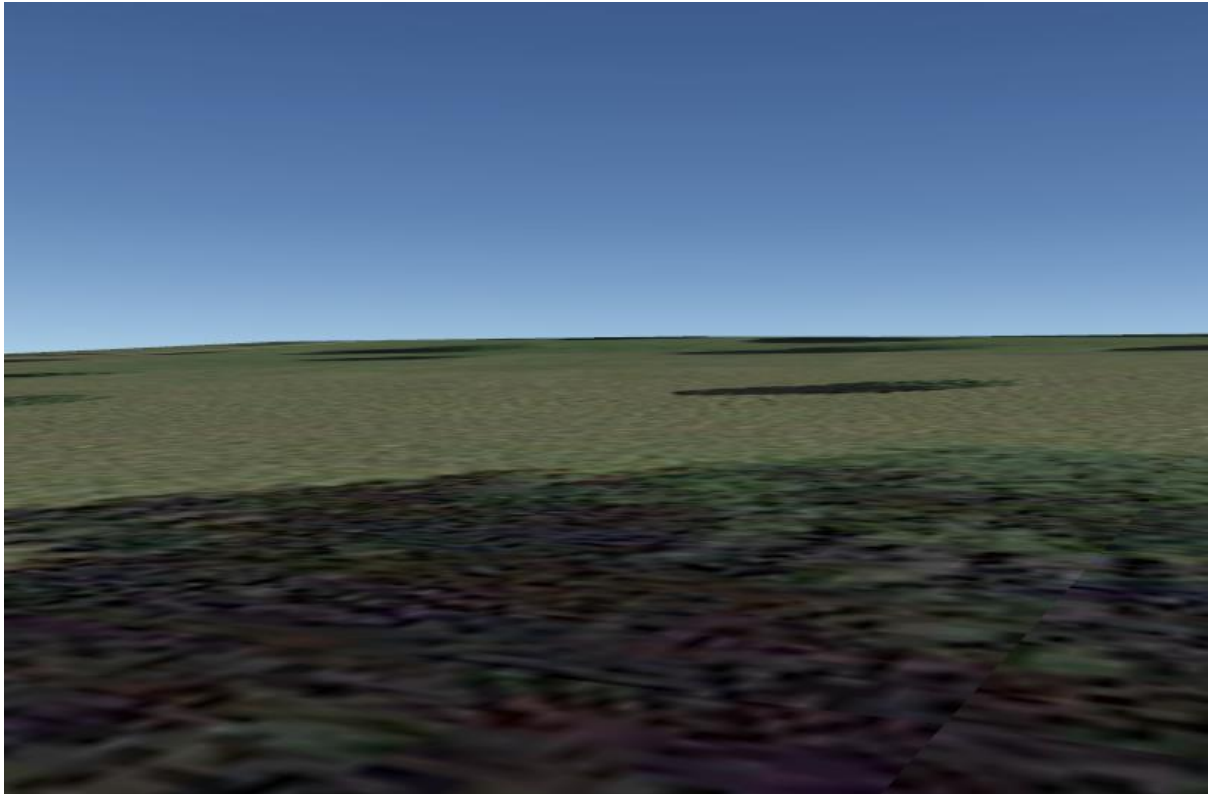
Receptor 44



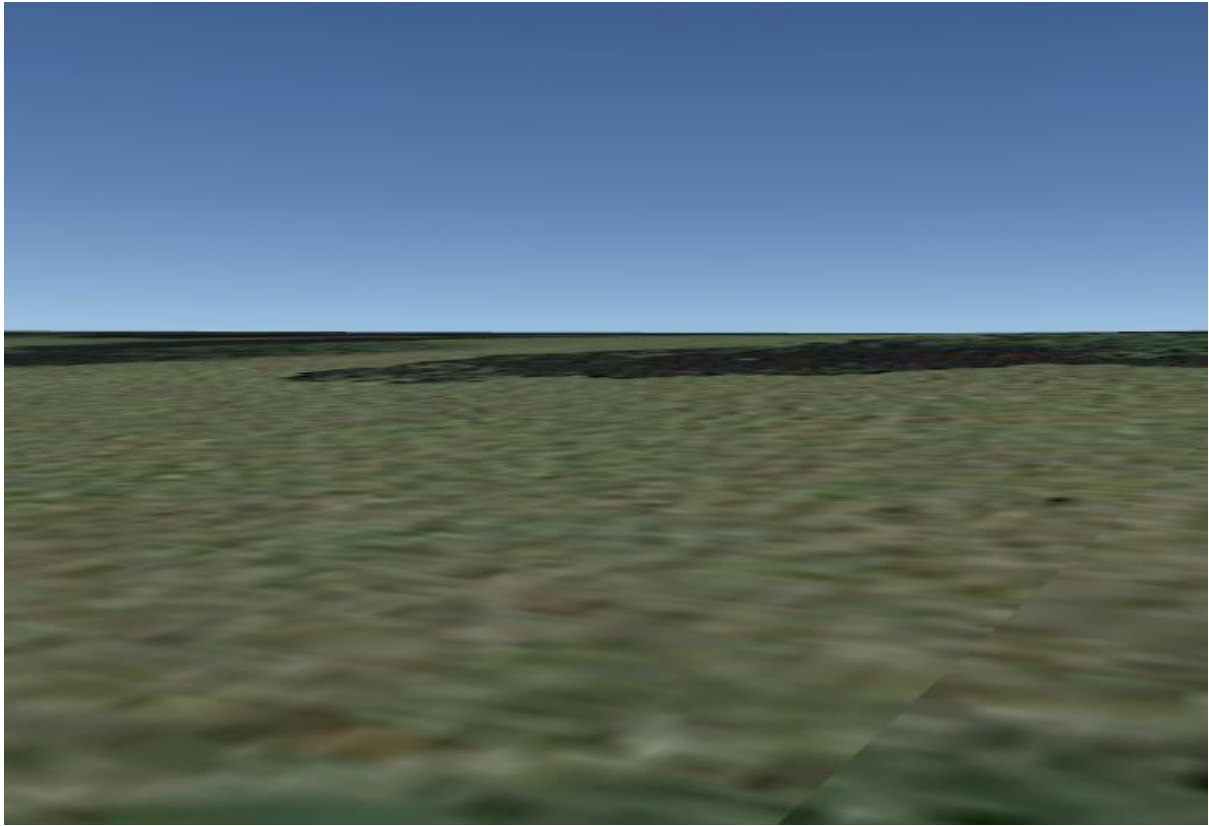
Receptor 45



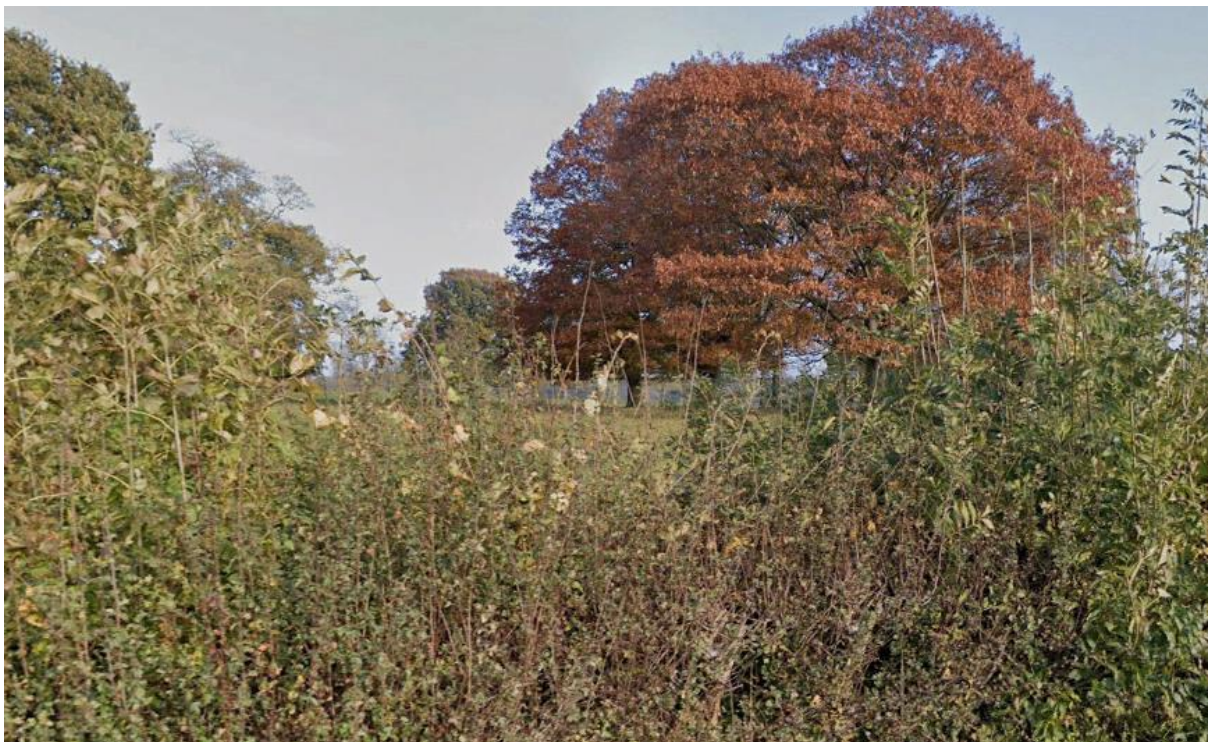
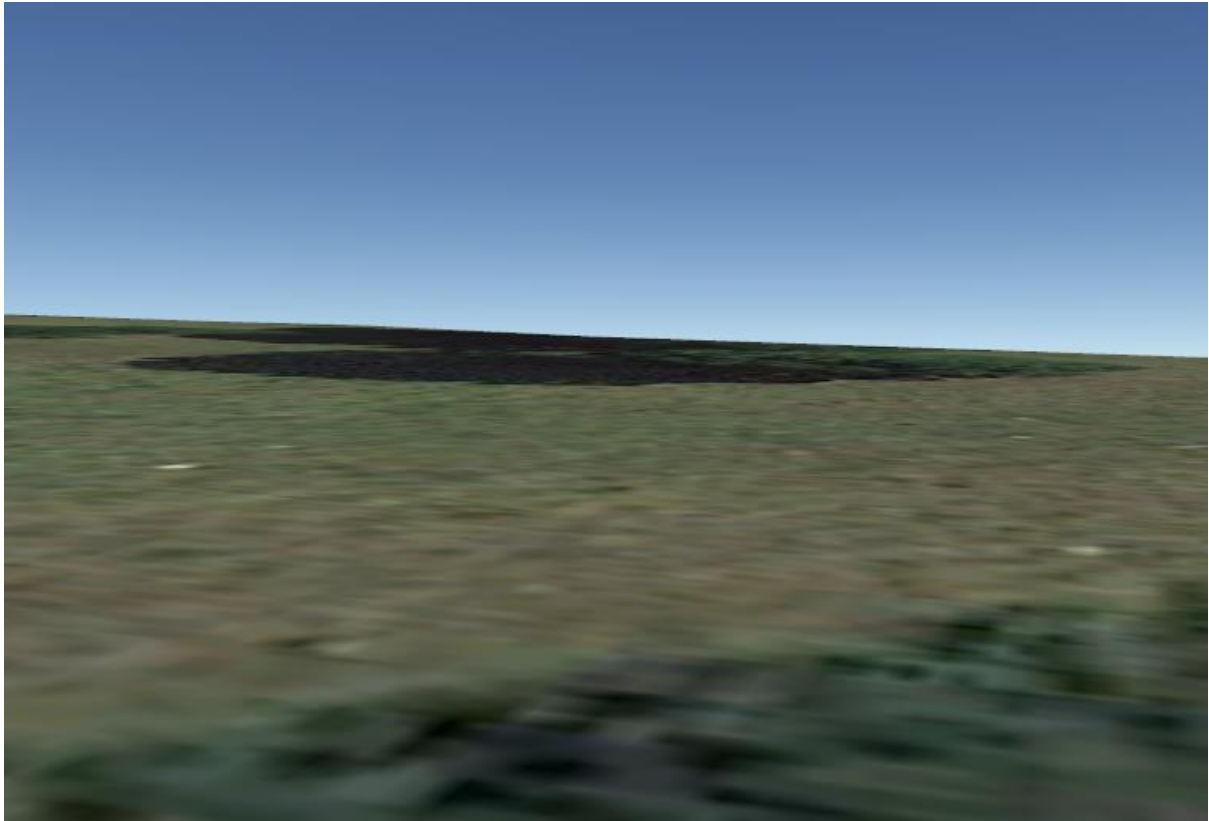
Receptor 46



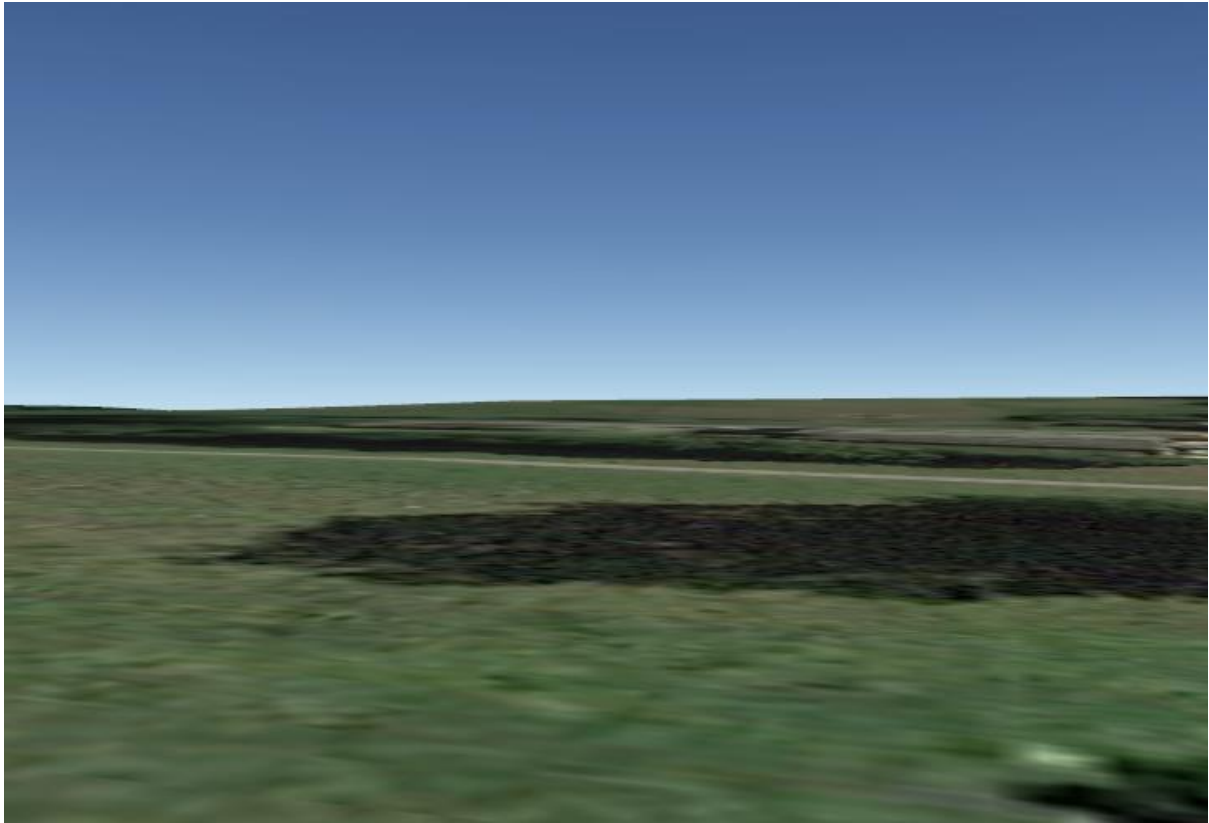
Receptor 47



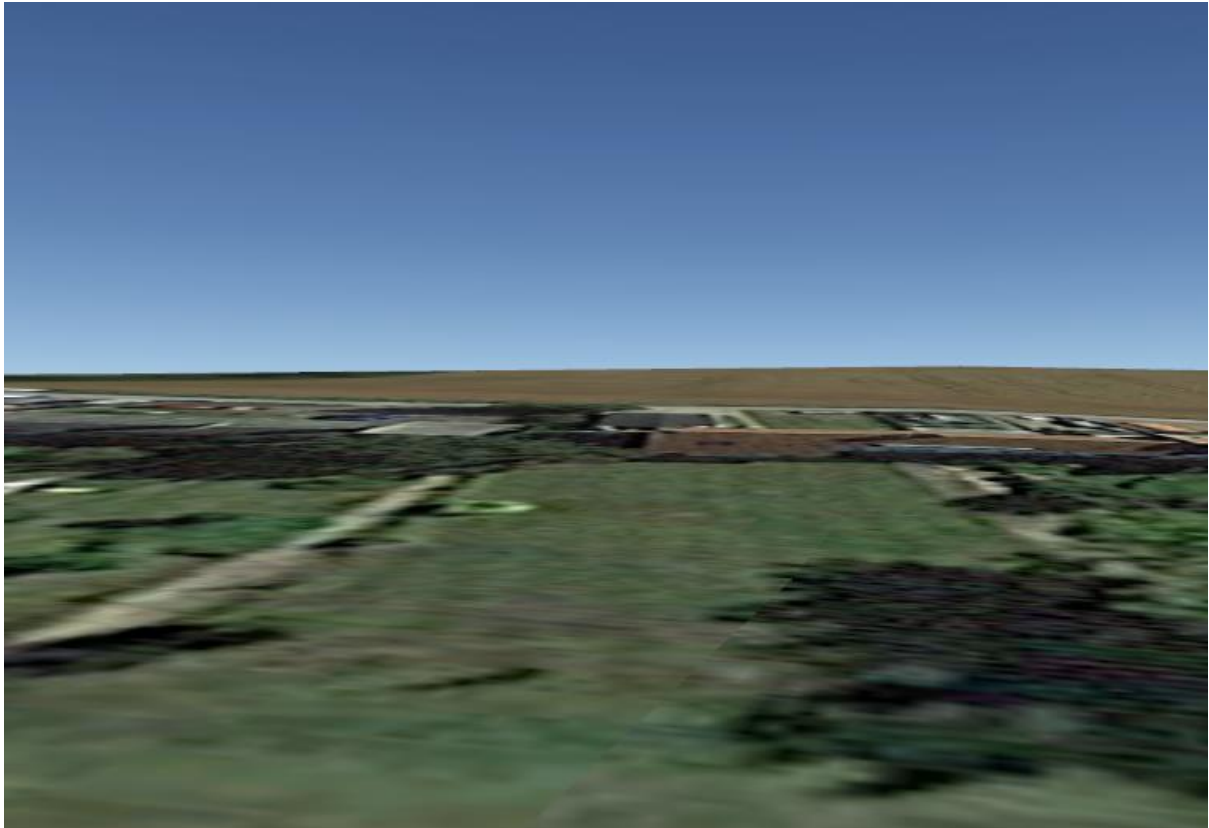
Receptor 48



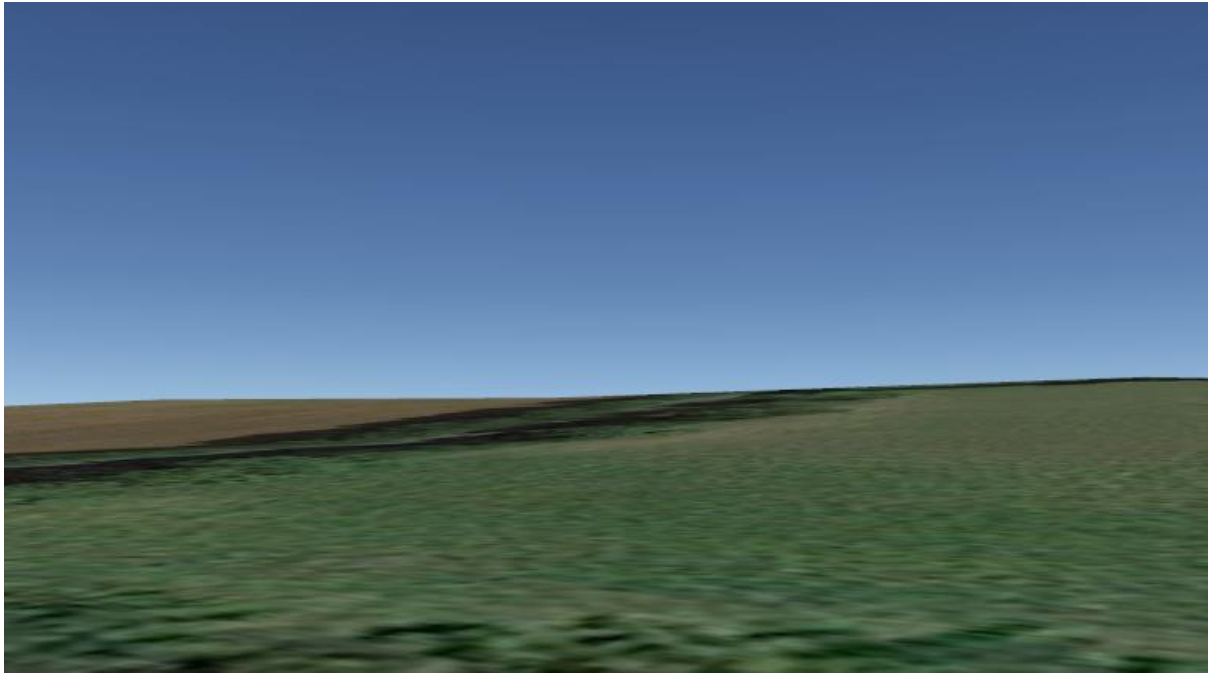
Receptor 49



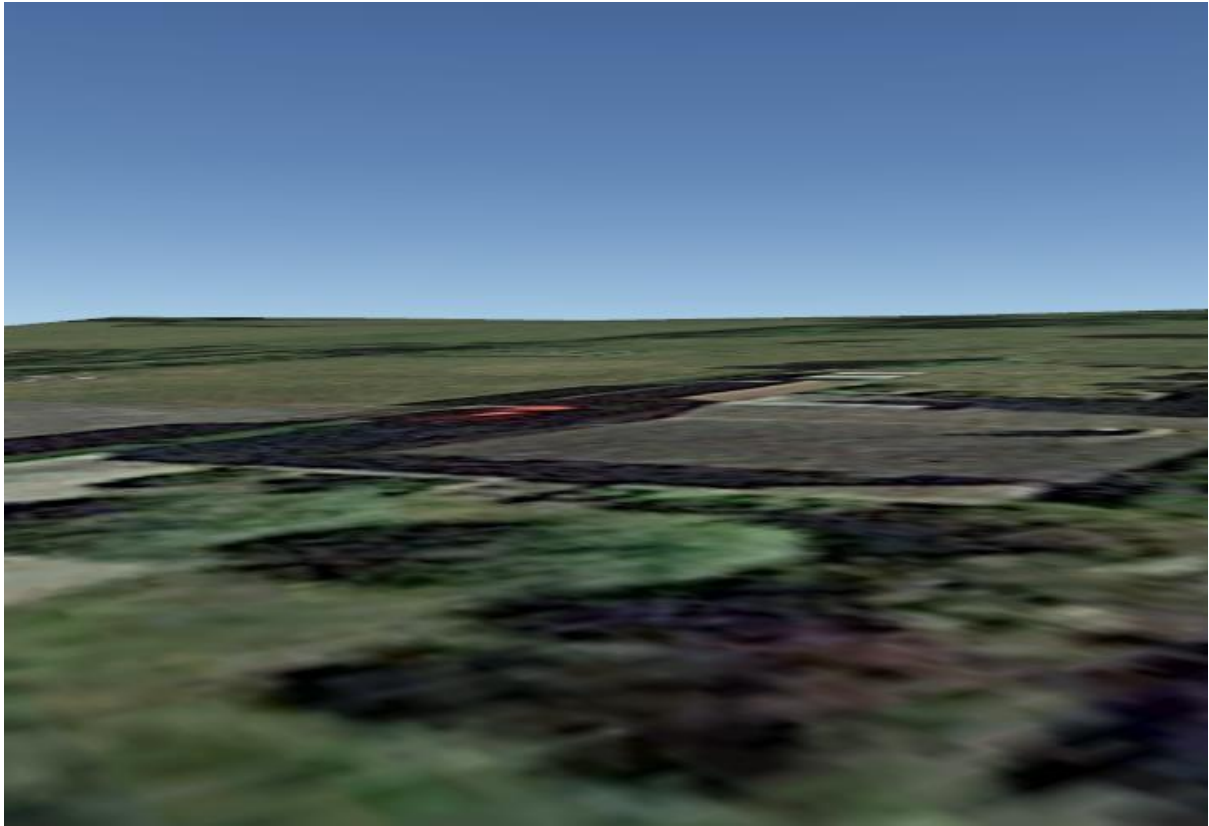
Receptor 50



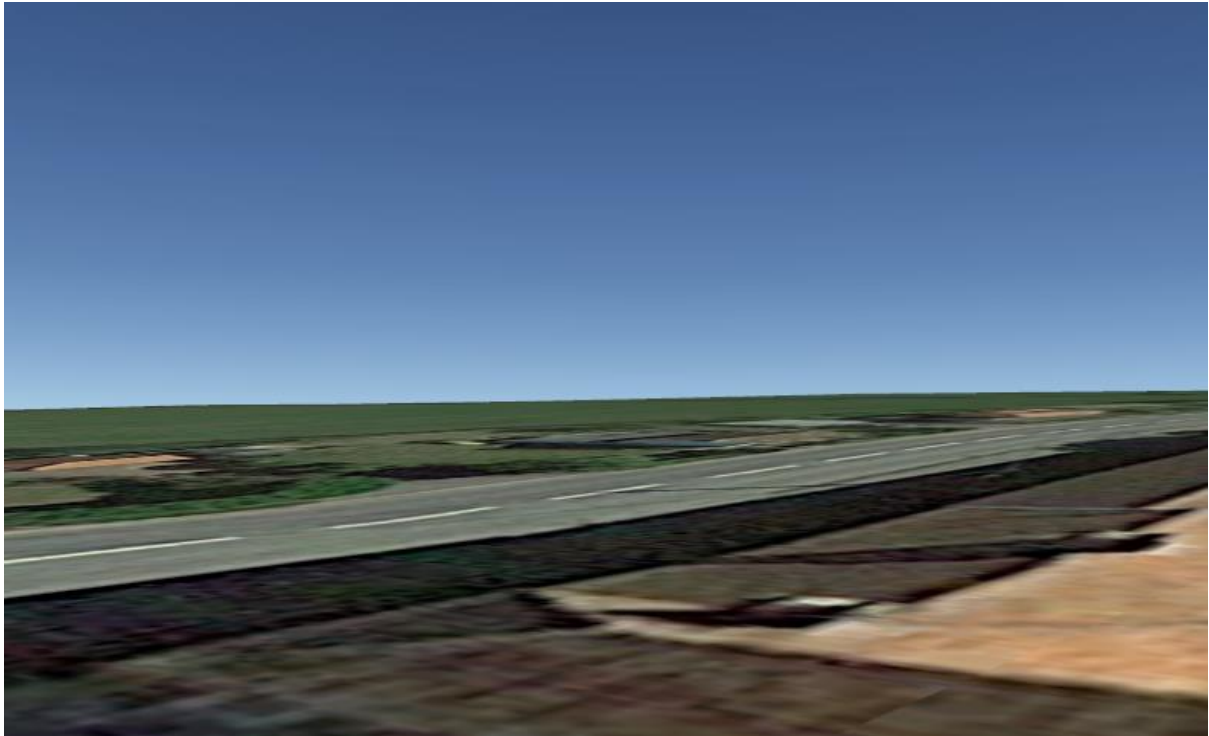
Receptor 51



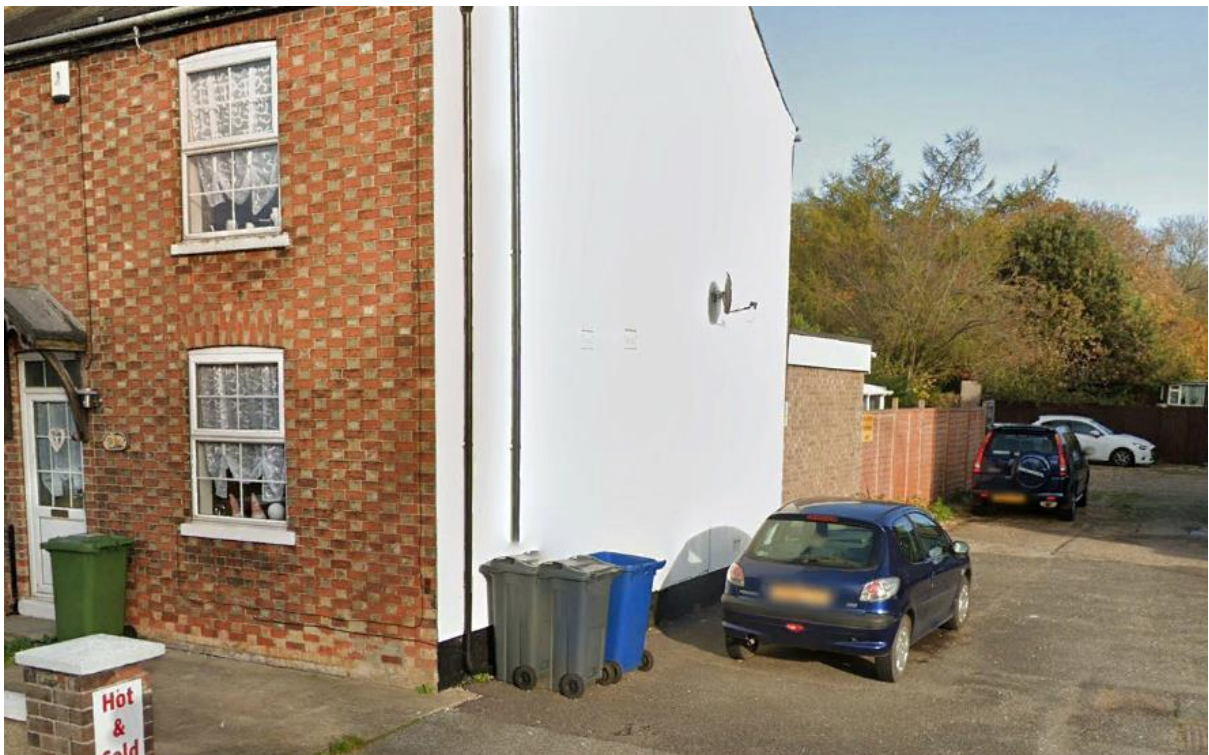
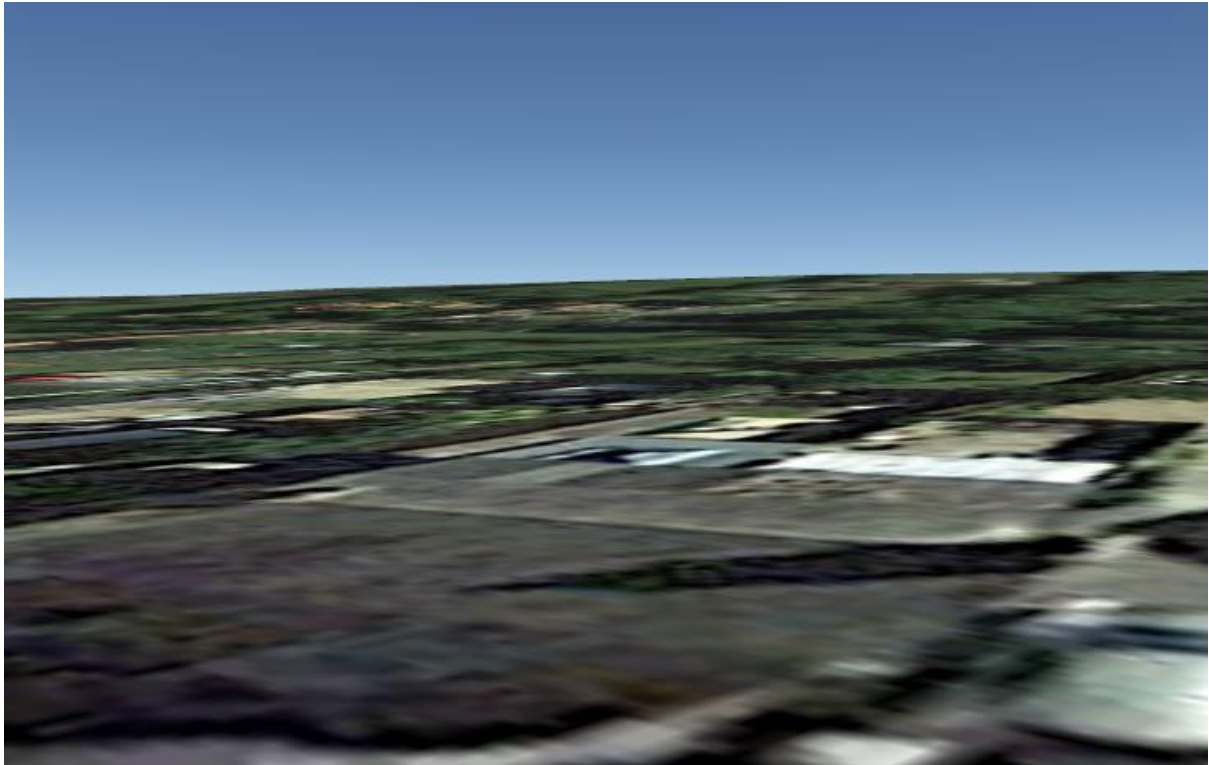
Receptor 52



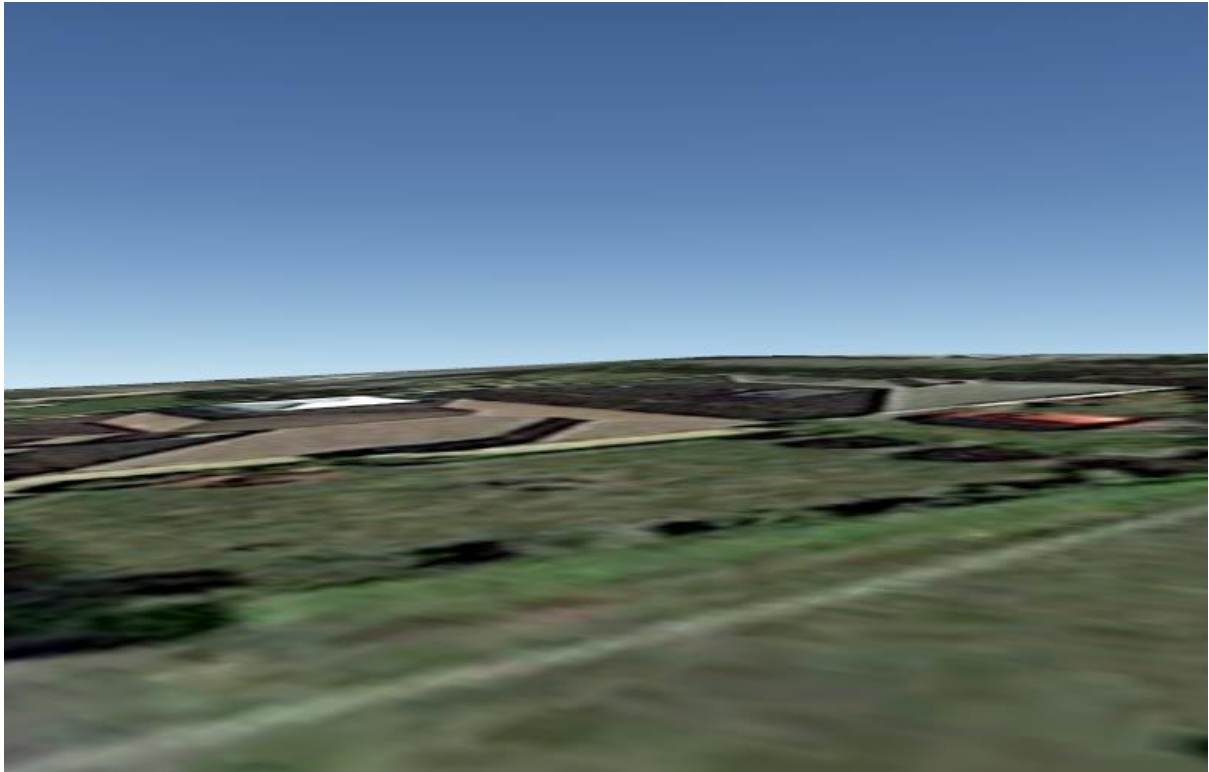
Receptor 53



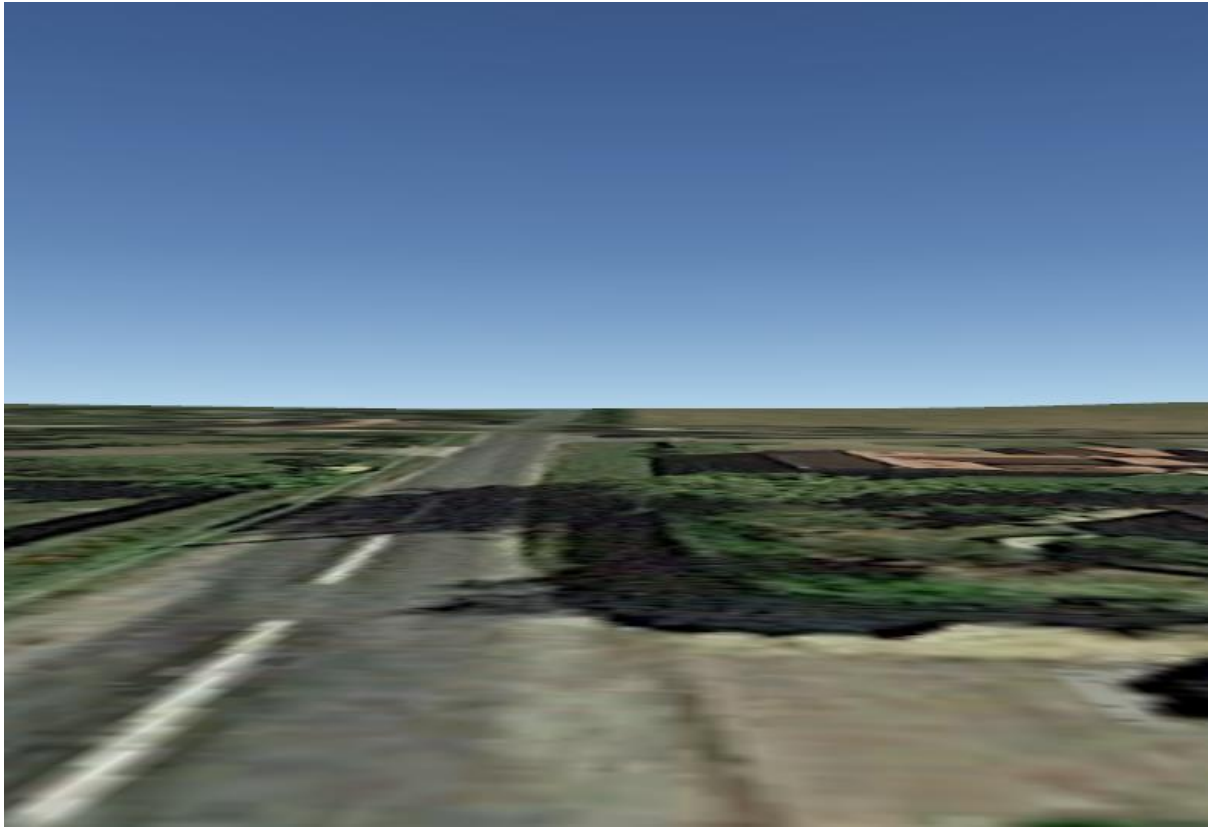
Receptor 54



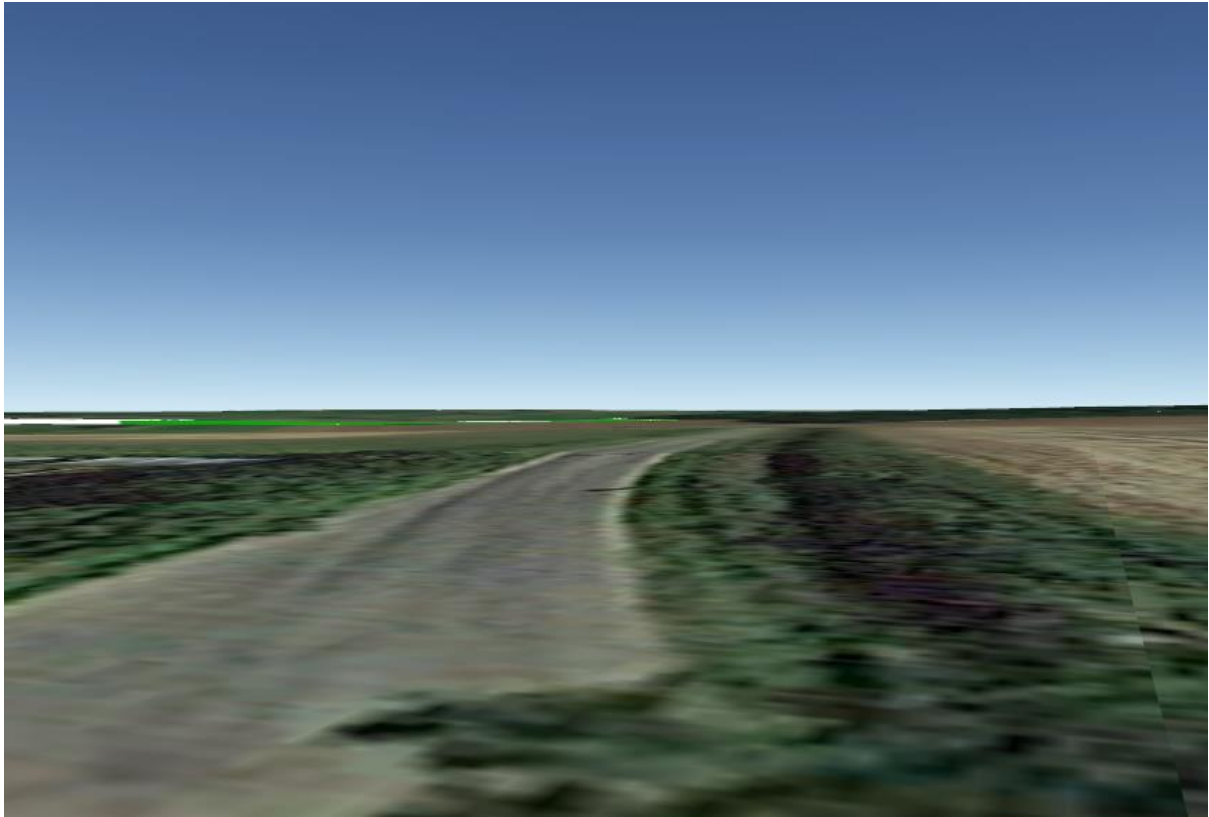
Receptor 55



Receptor 56



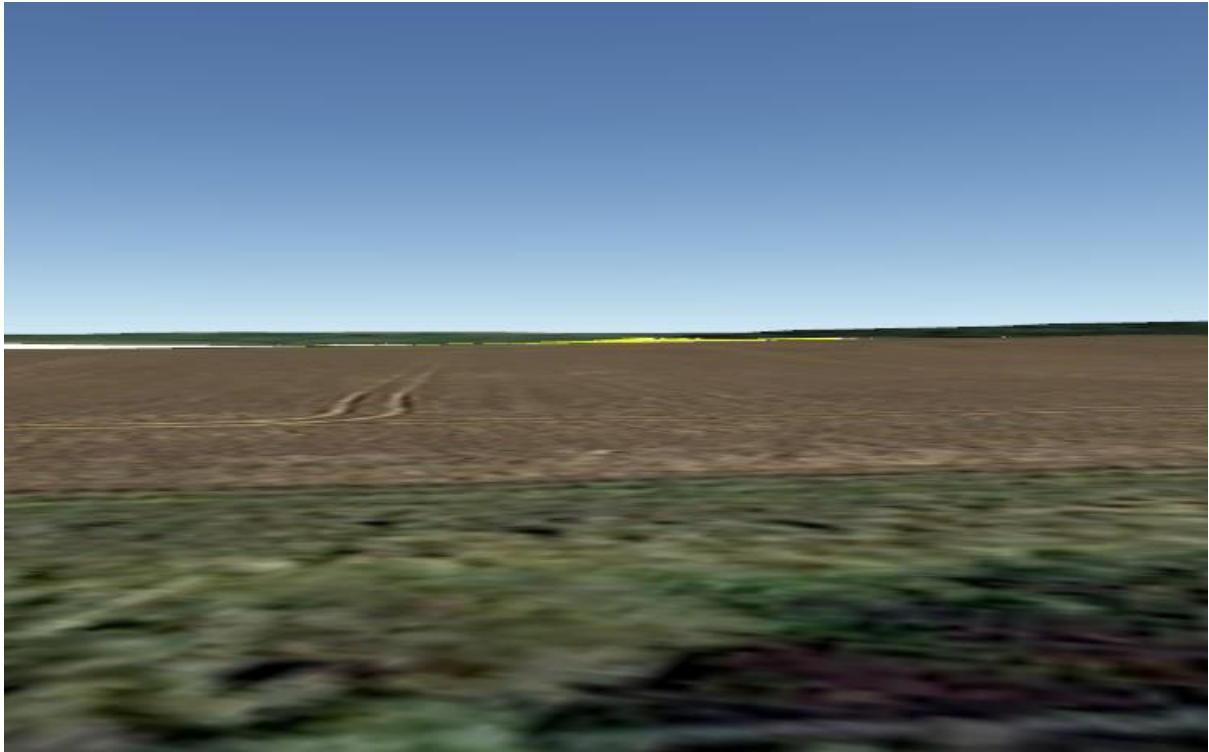
Receptor 57



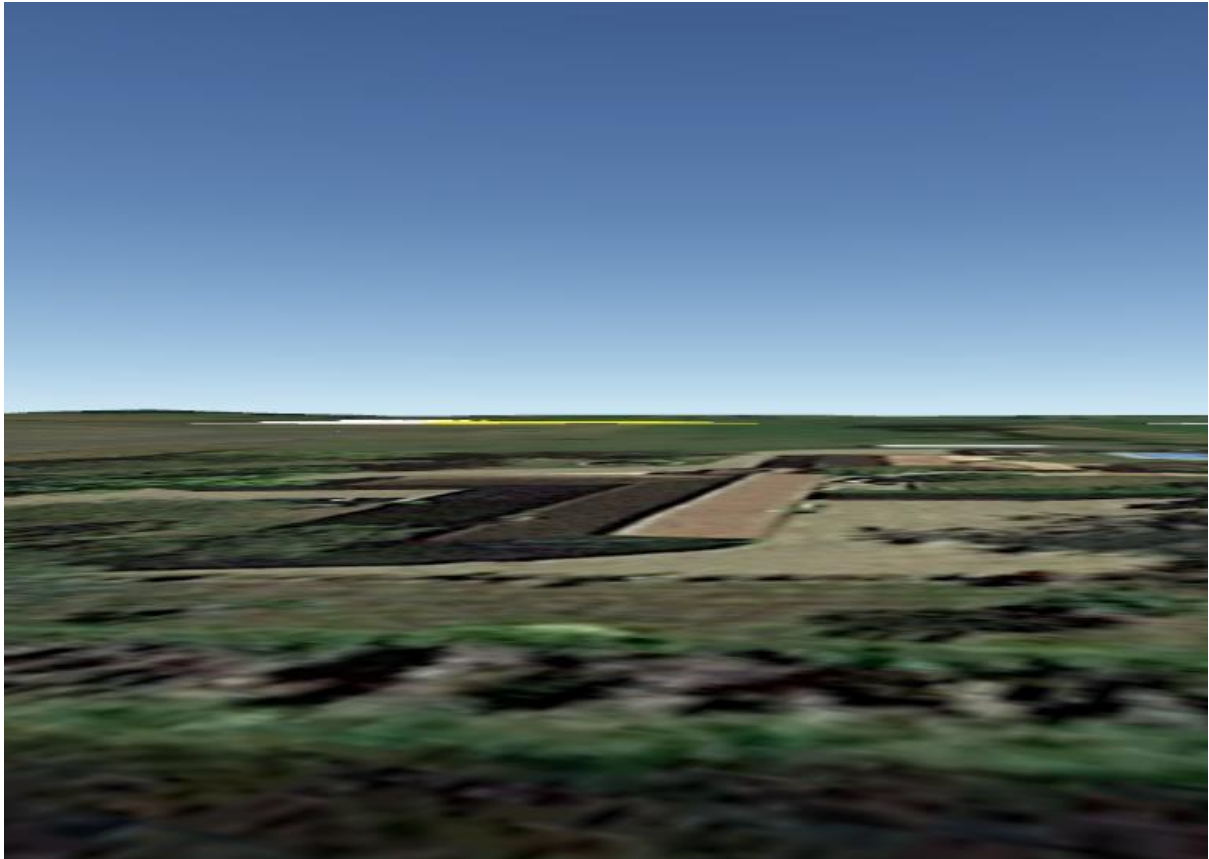
Receptor 58



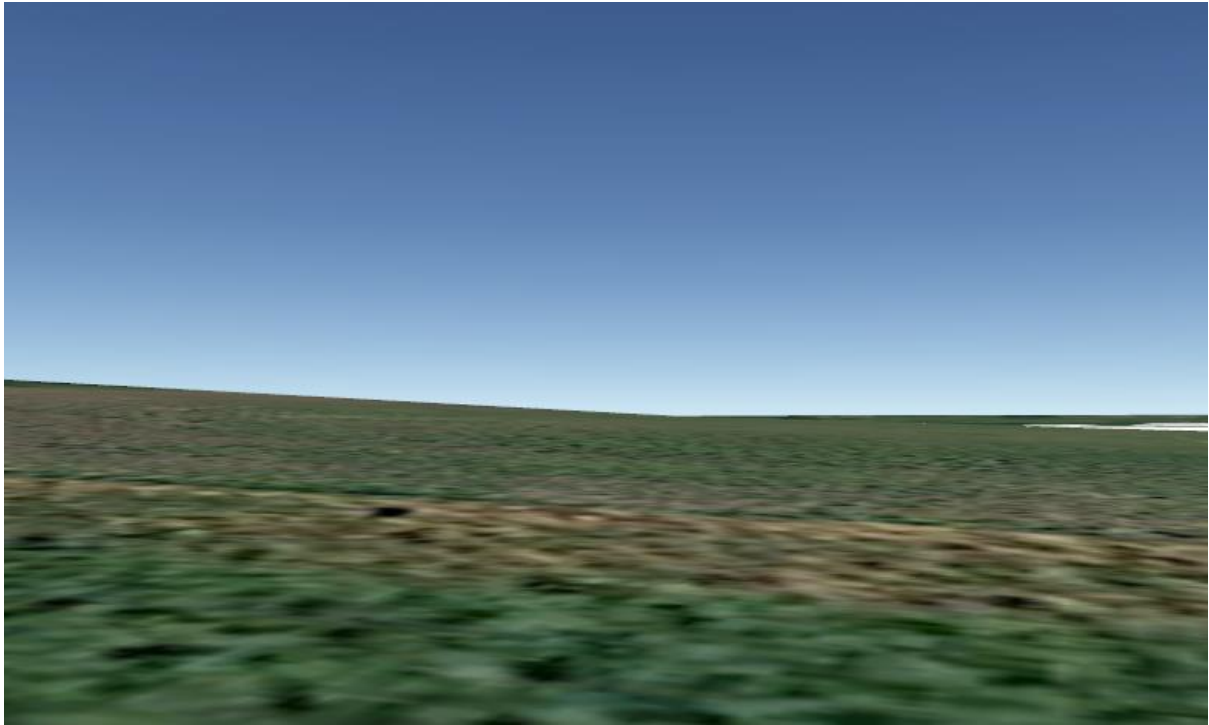
Receptor 59



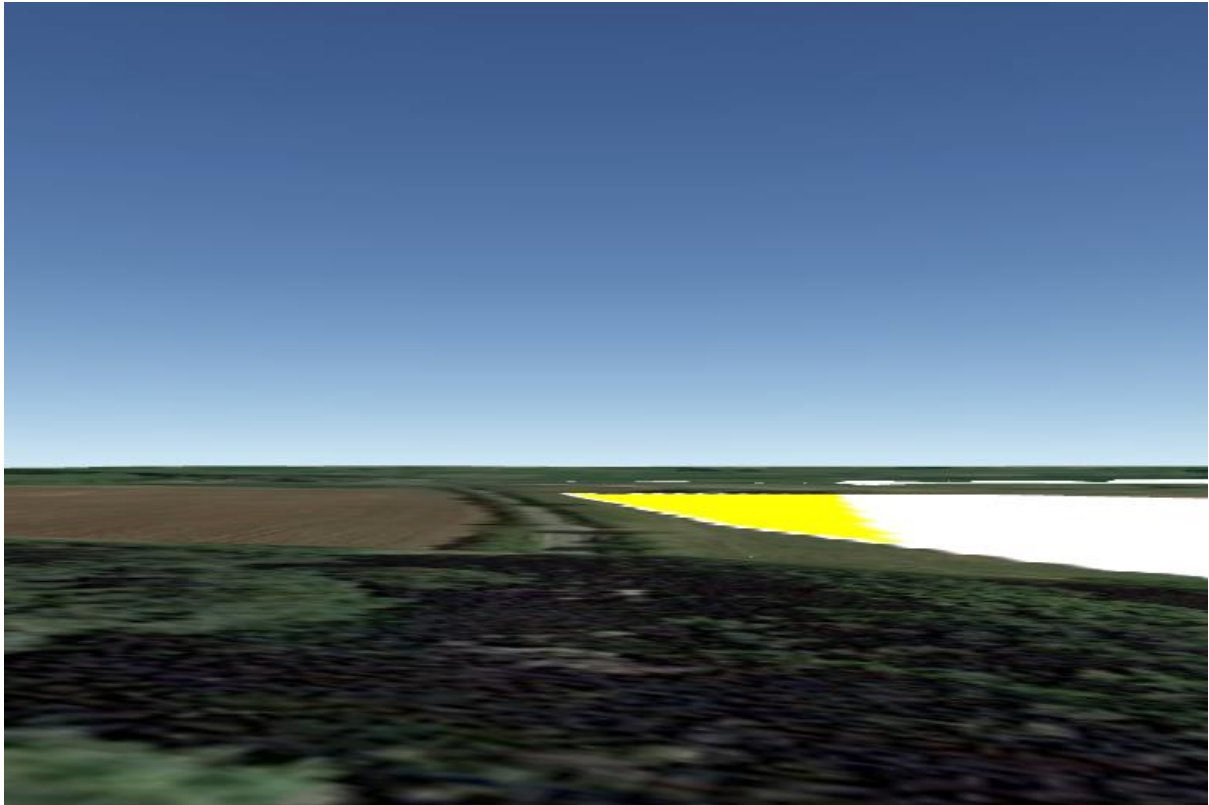
Receptor 60



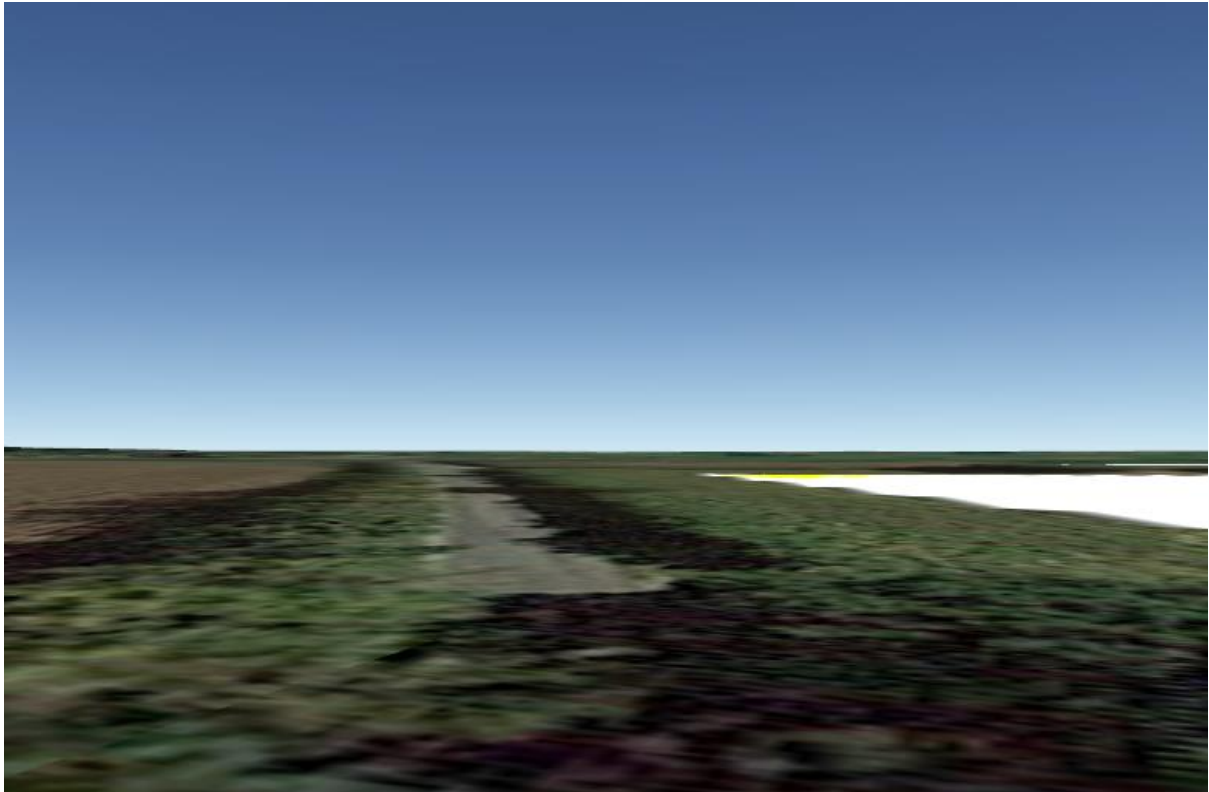
Receptor 61



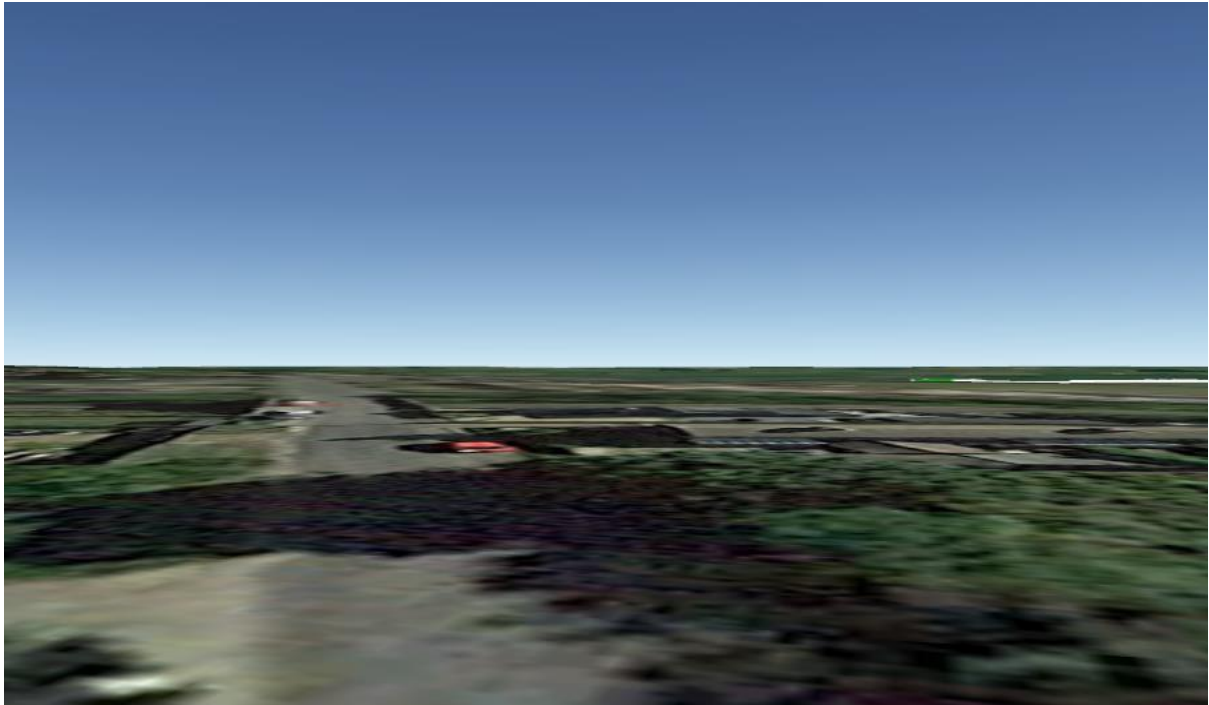
Receptor 62



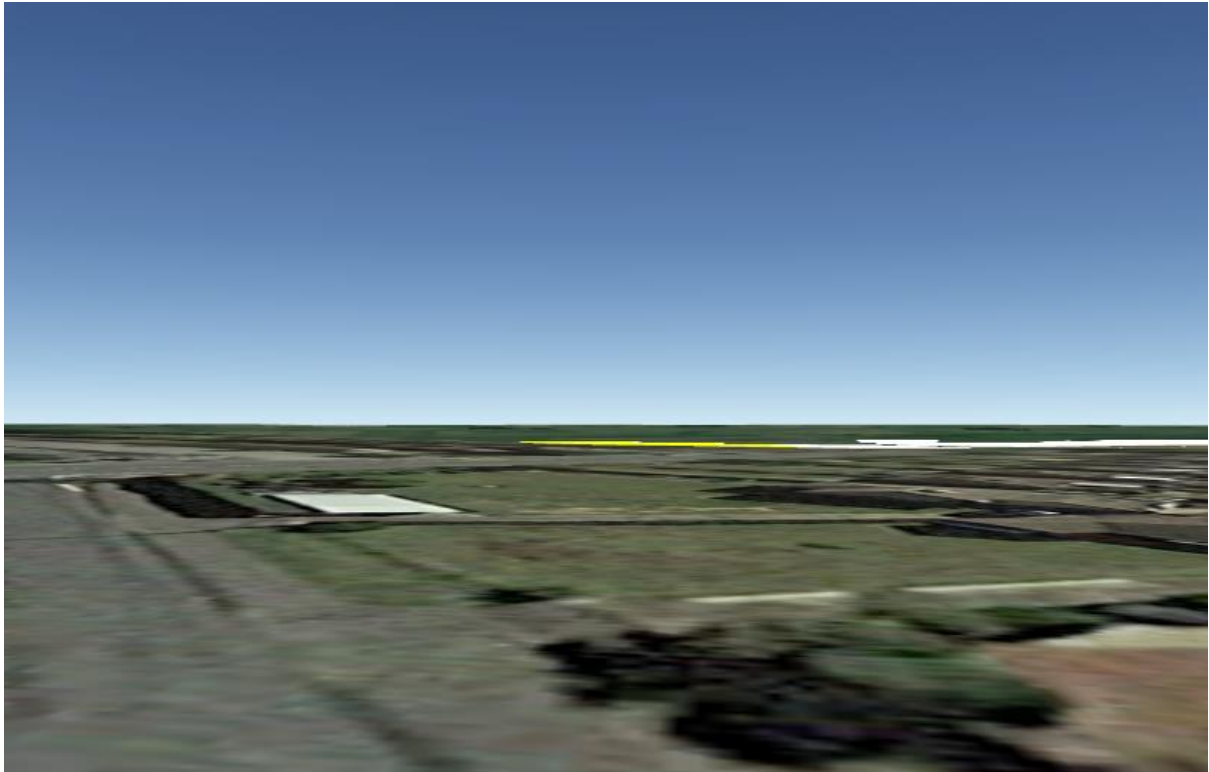
Receptor 63



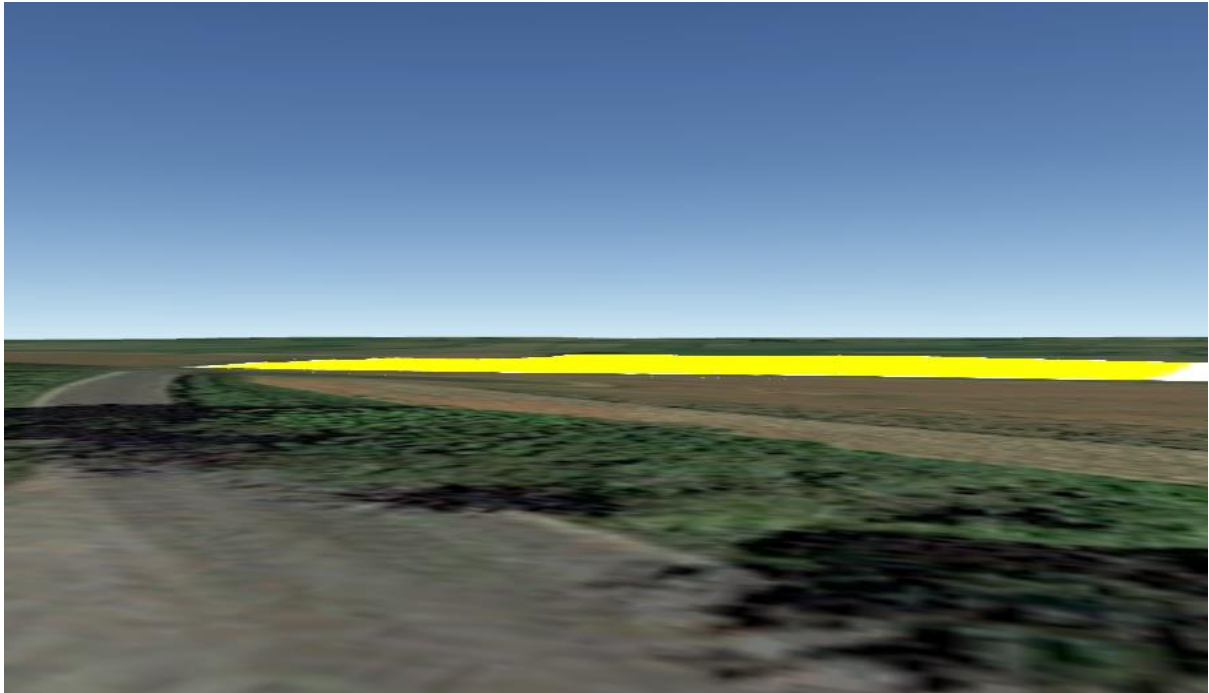
Receptor 64



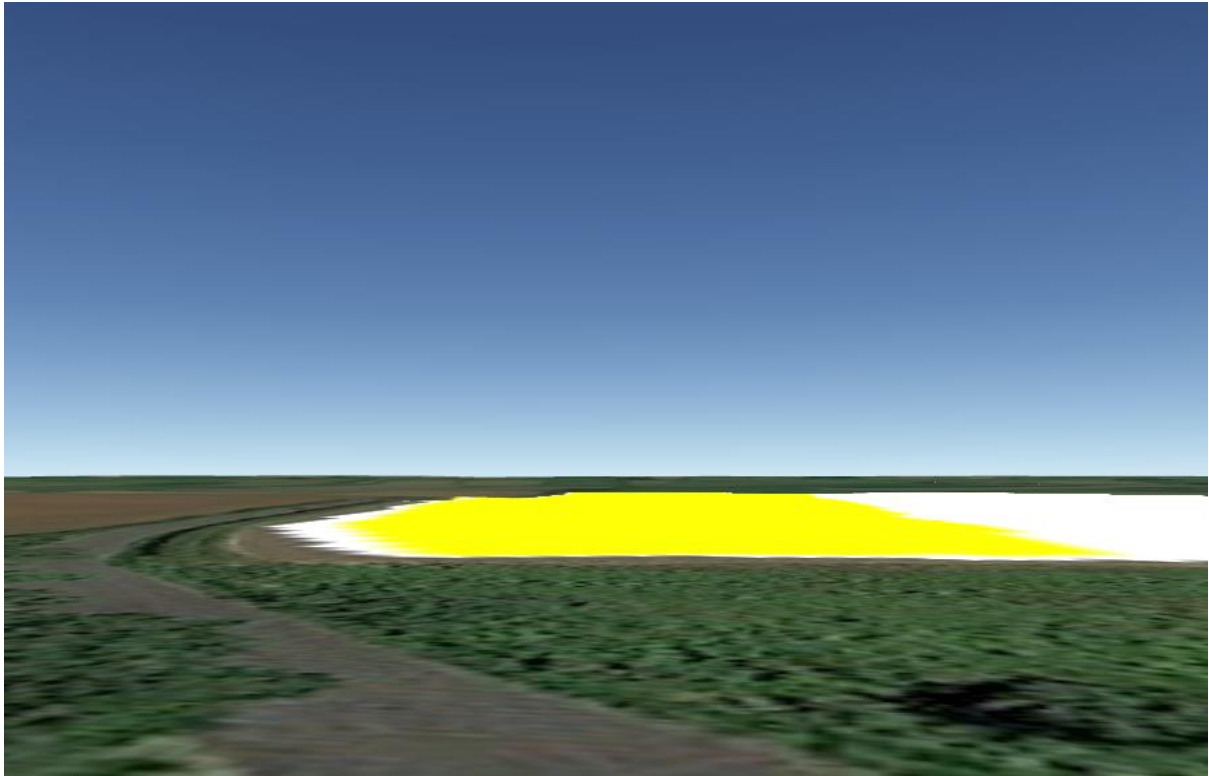
Receptor 65



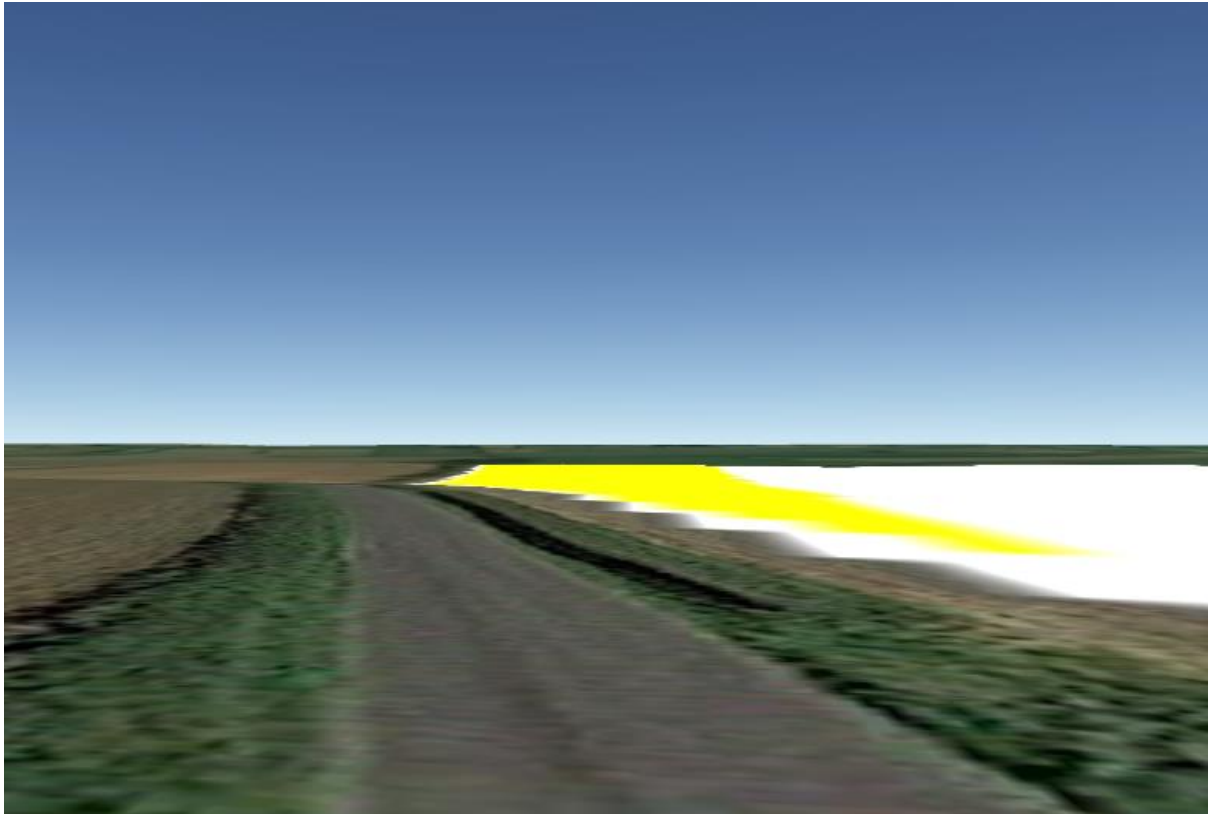
Receptor 66



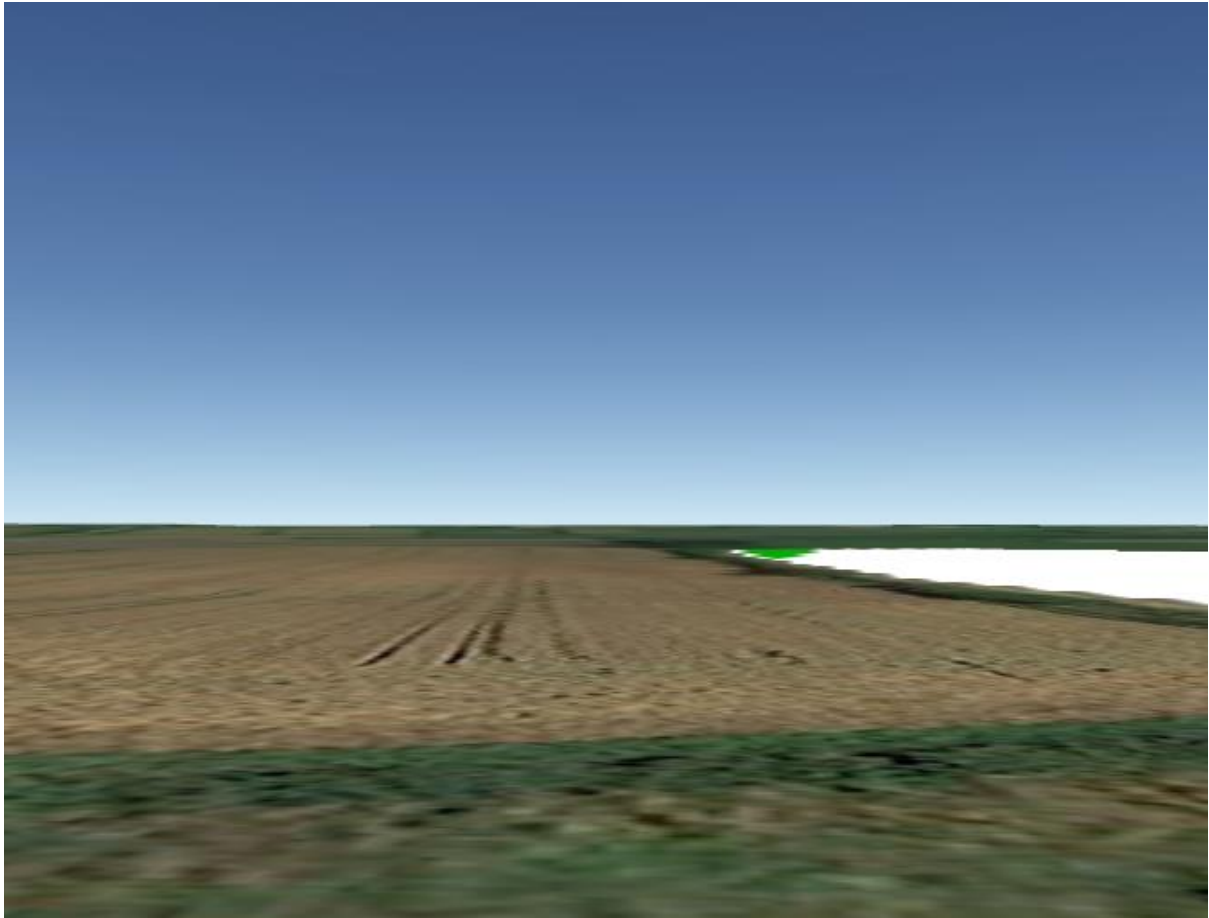
Receptor 67



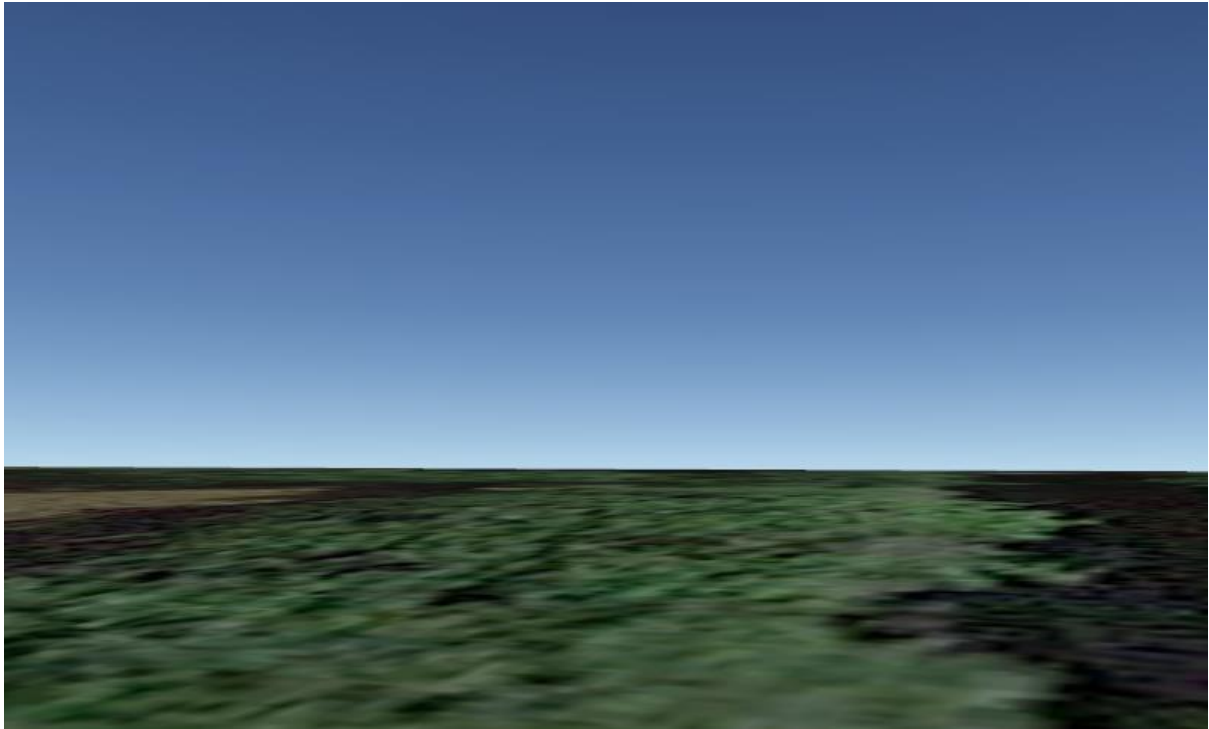
Receptor 68



Receptor 69

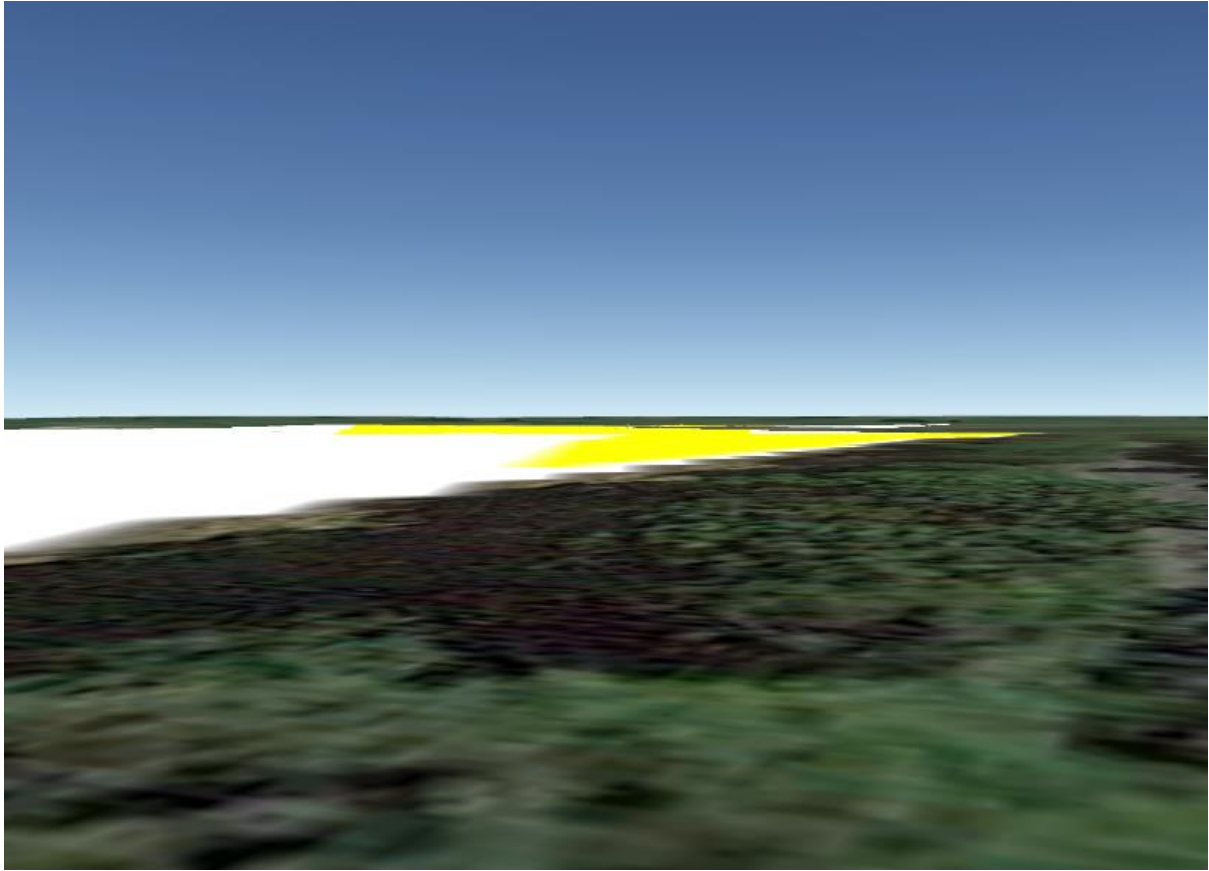


Receptor 70

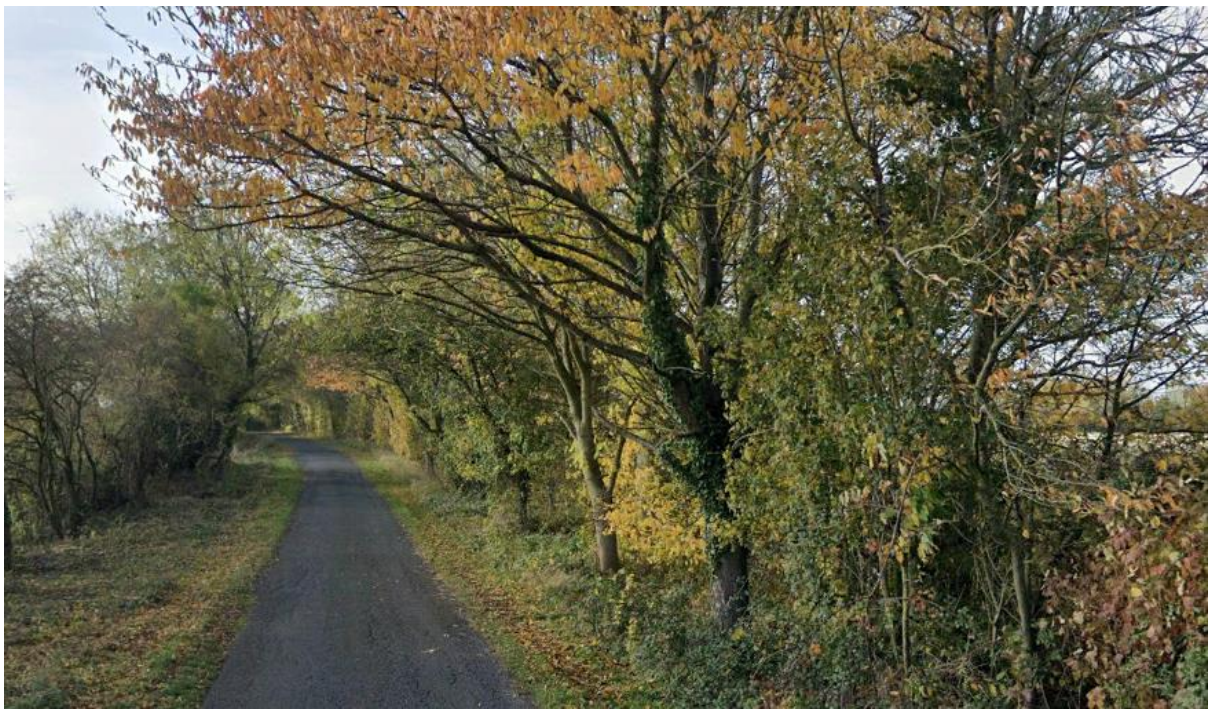
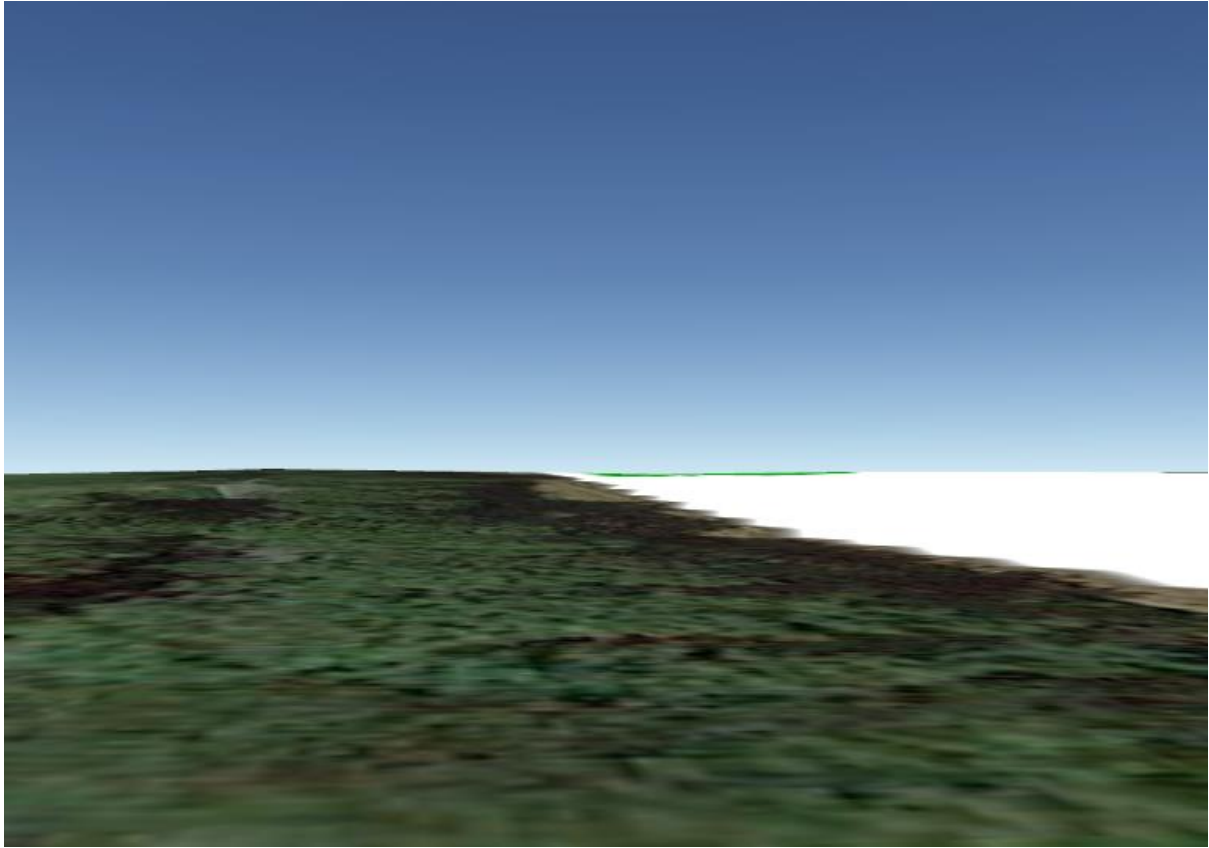


Receptor 71

East Facing

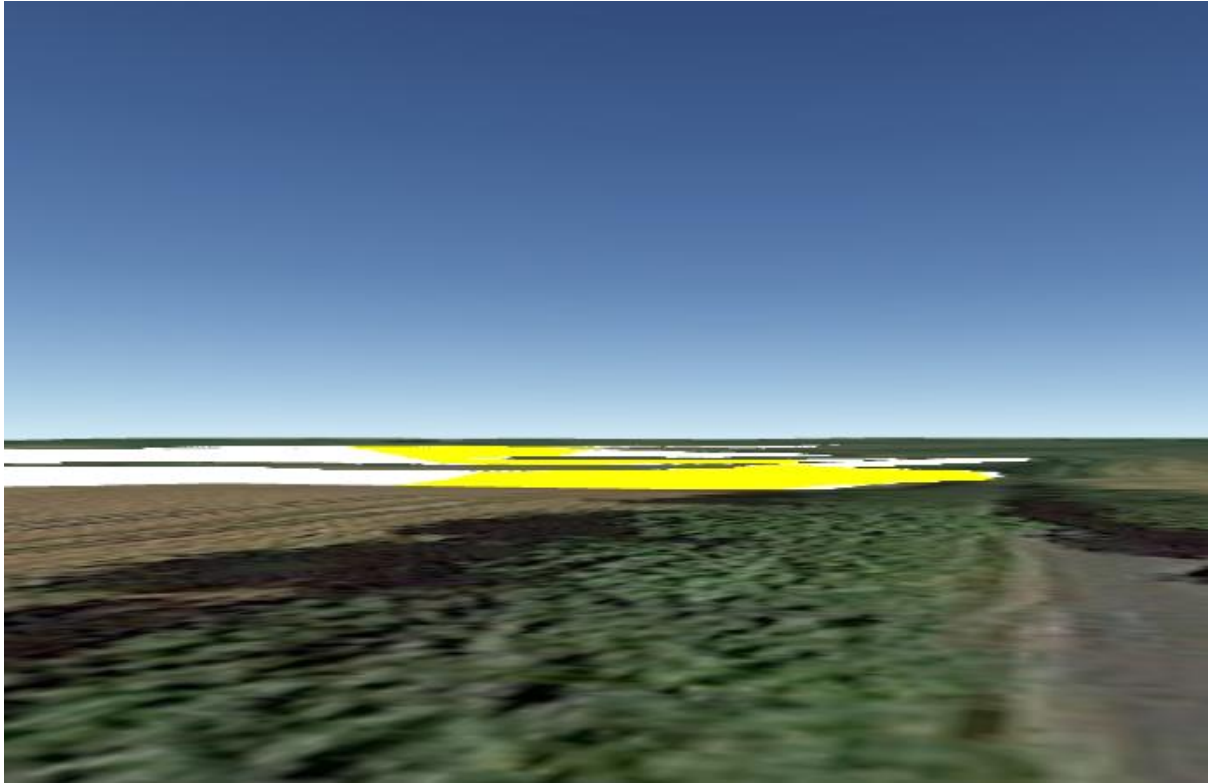


West Facing

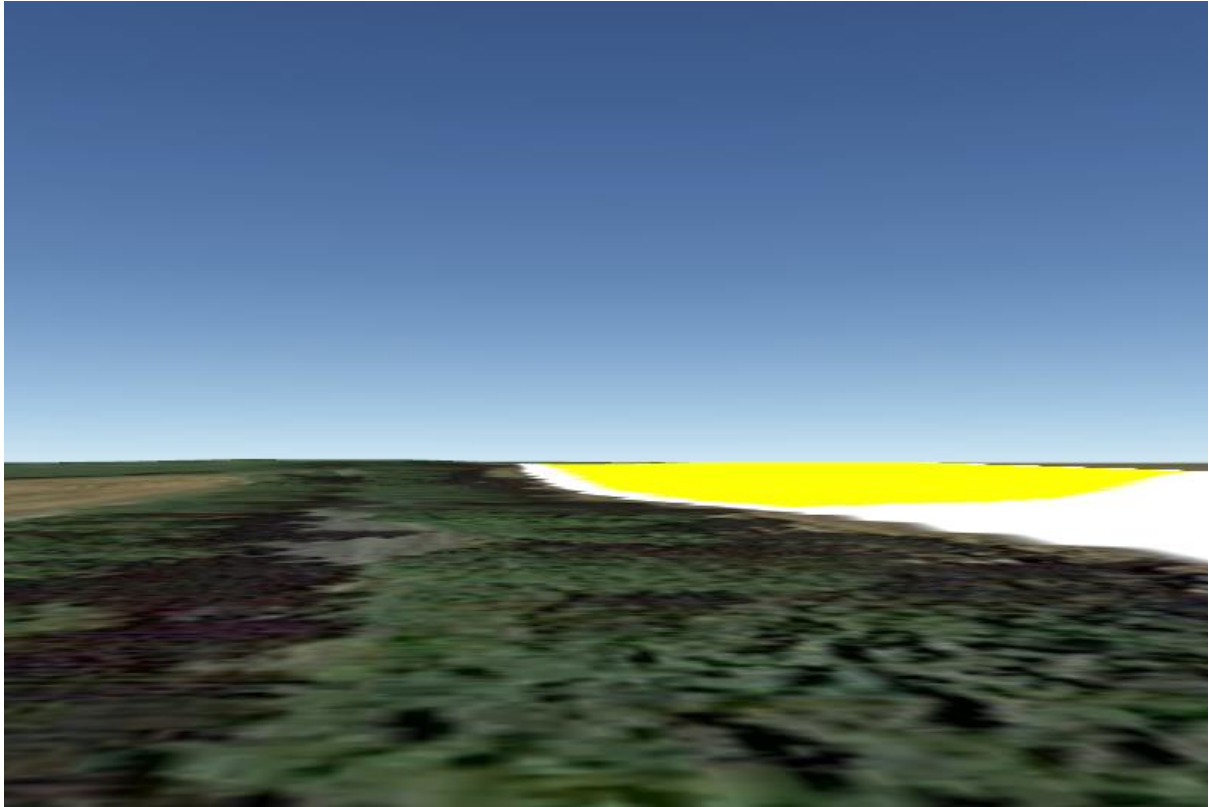


Receptor 72

East Facing

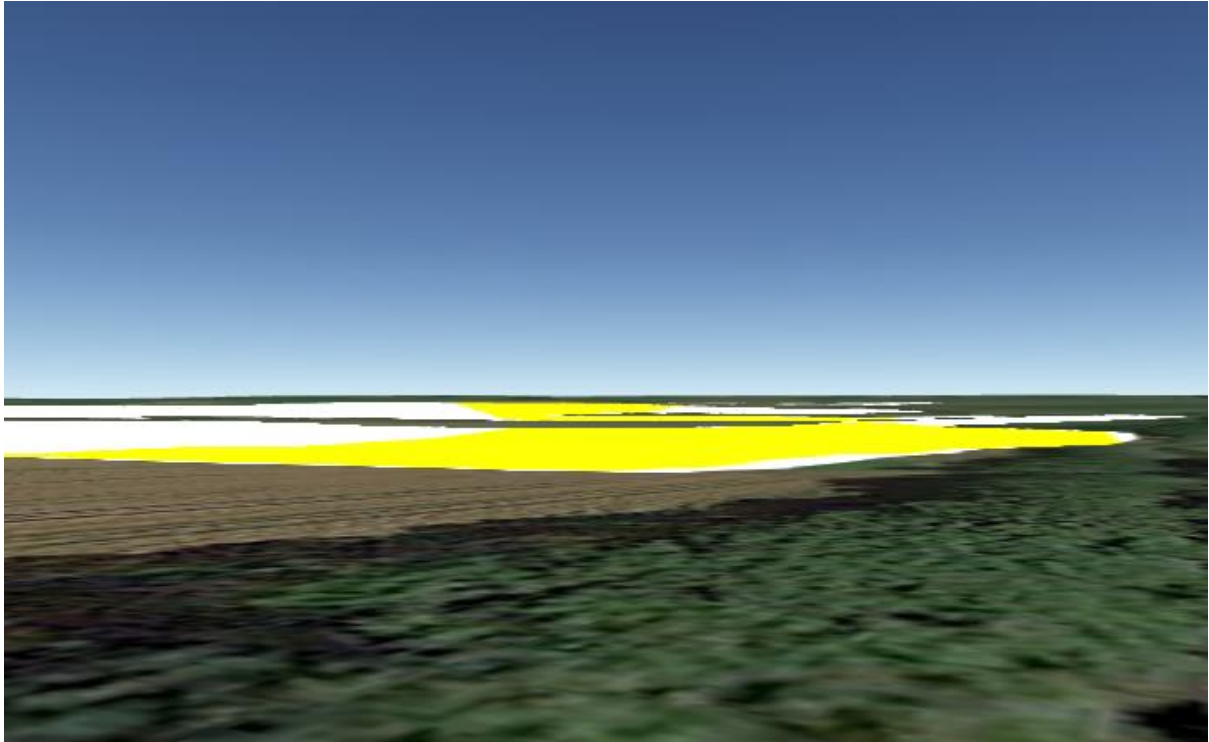


West Facing

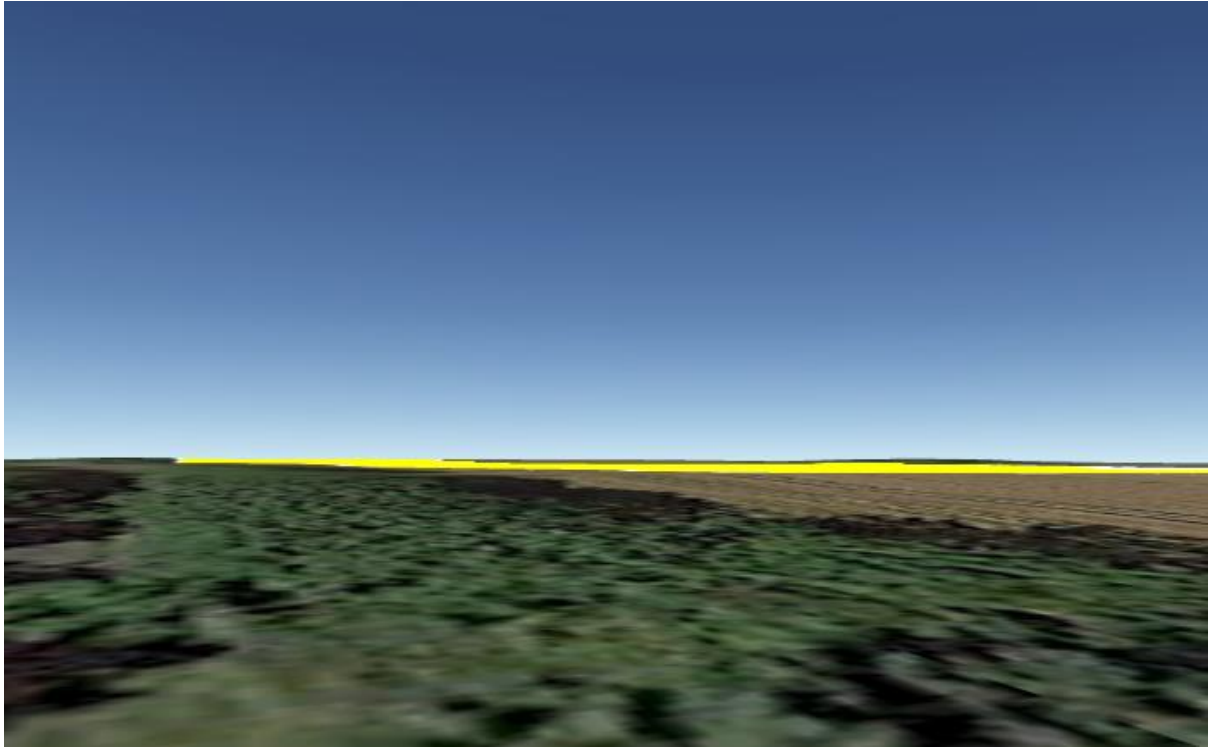


Receptor 73

East Facing

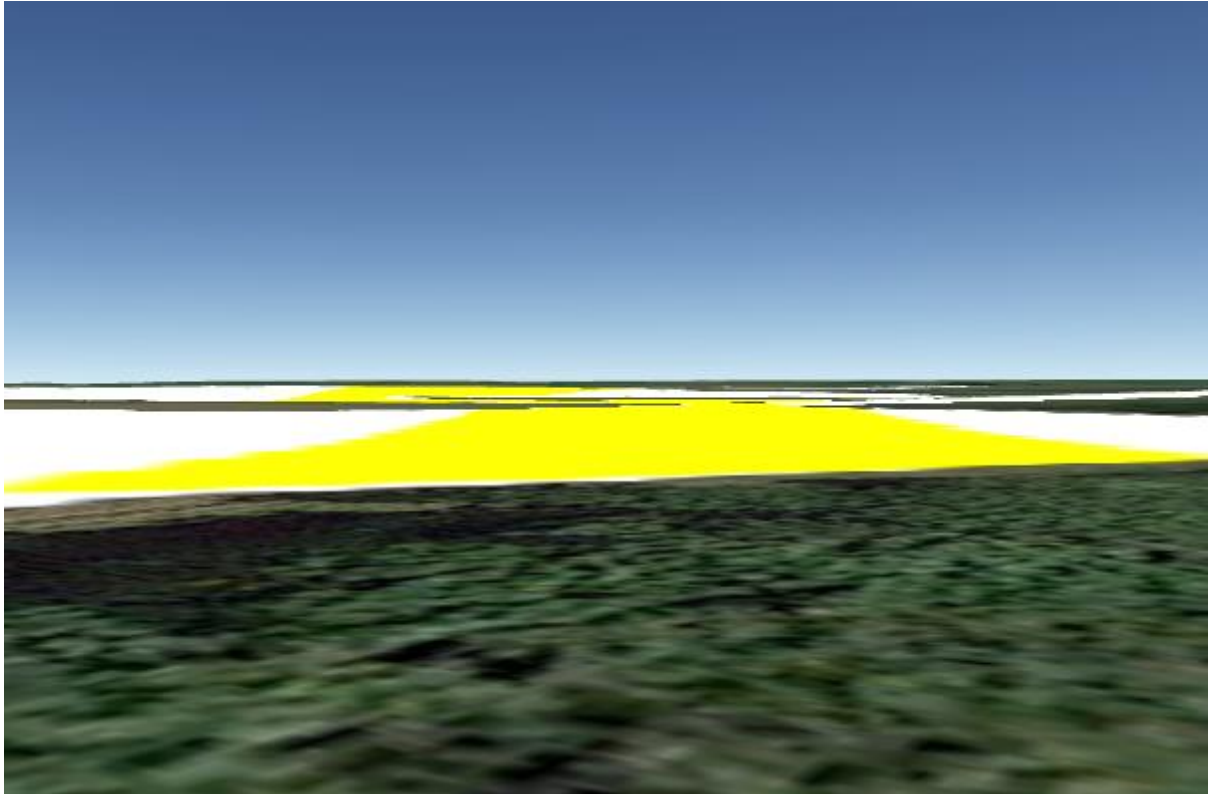


West Facing

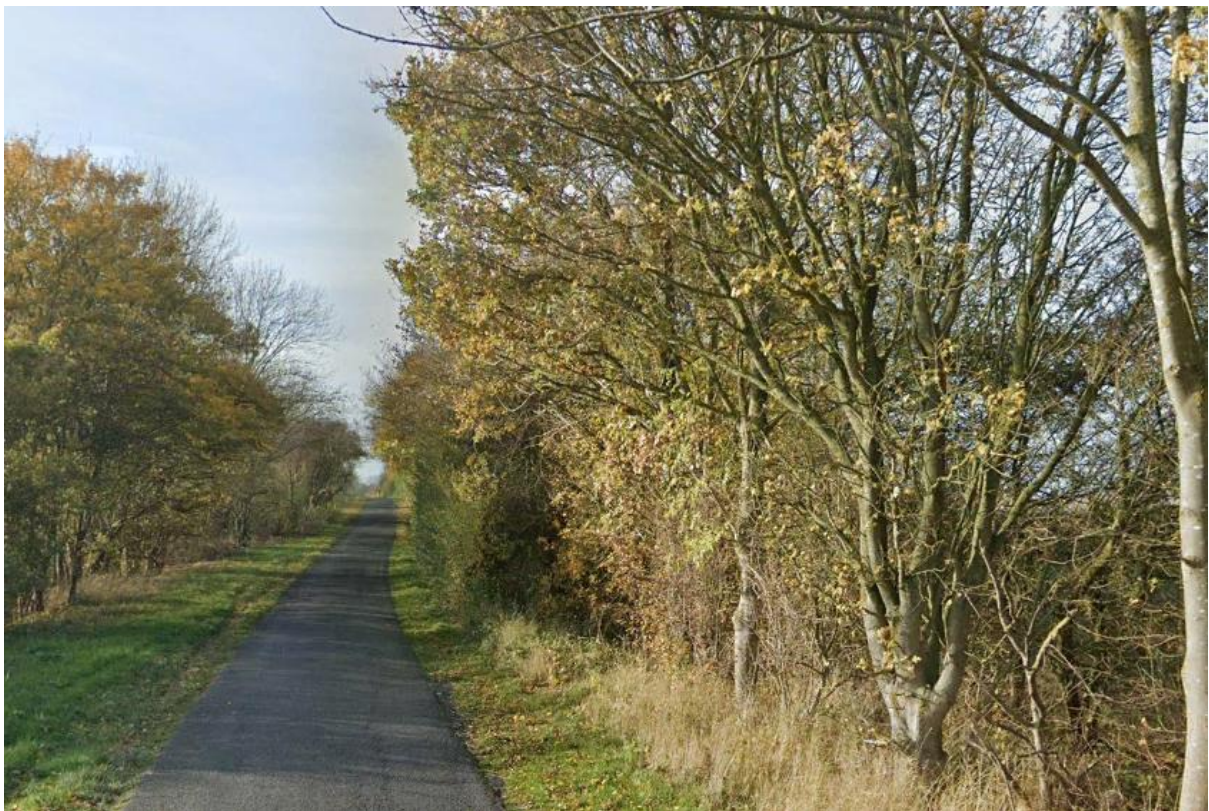
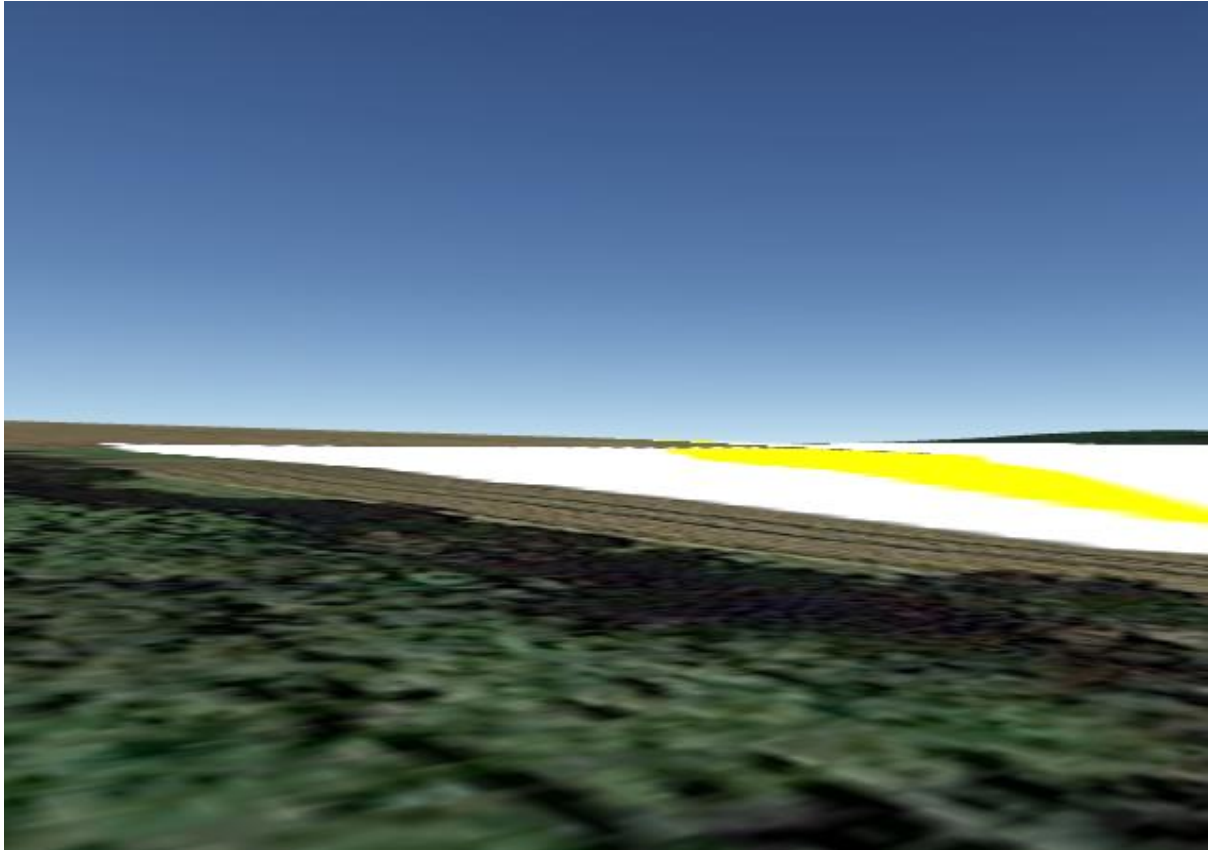


Receptor 74

East Facing

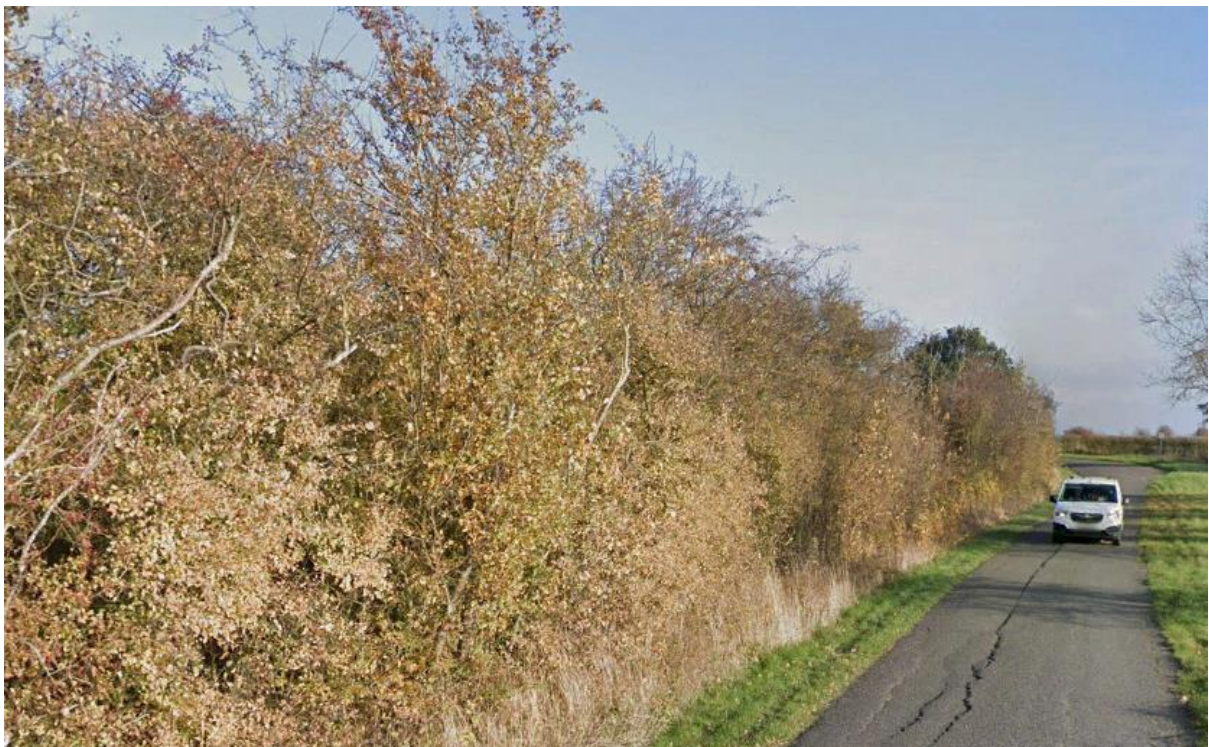
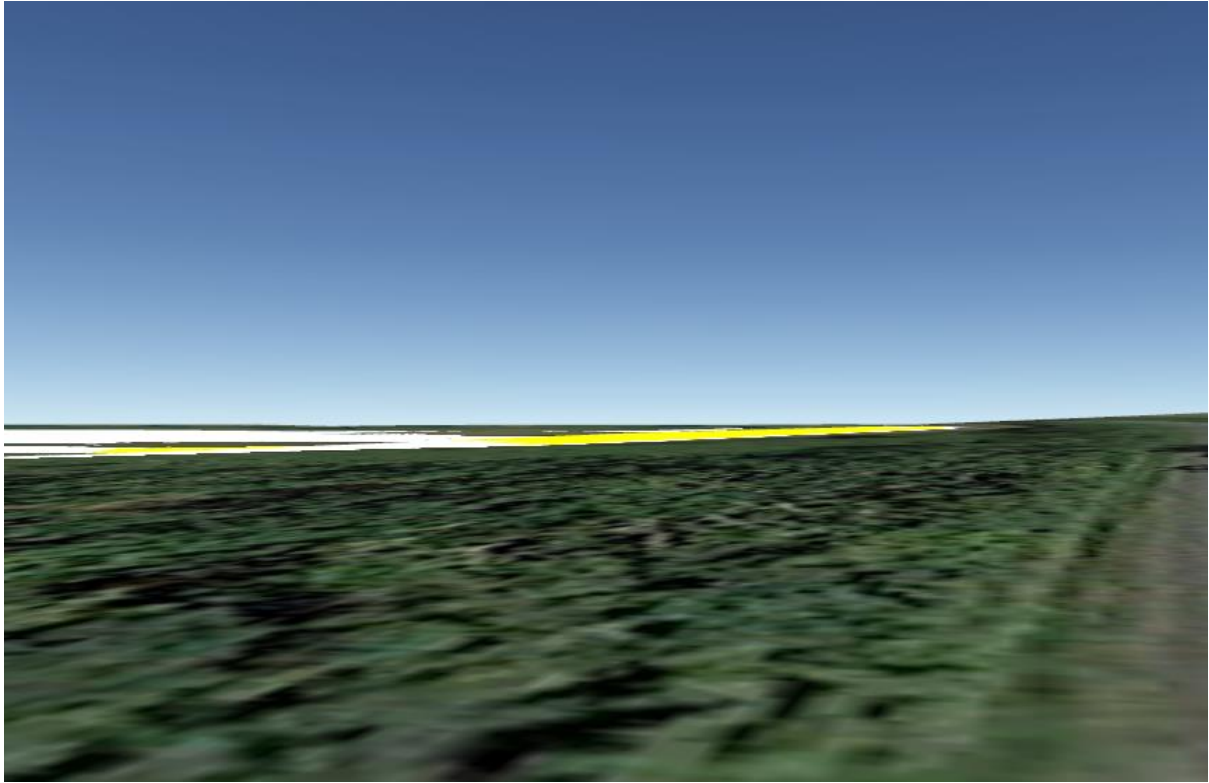


West Facing

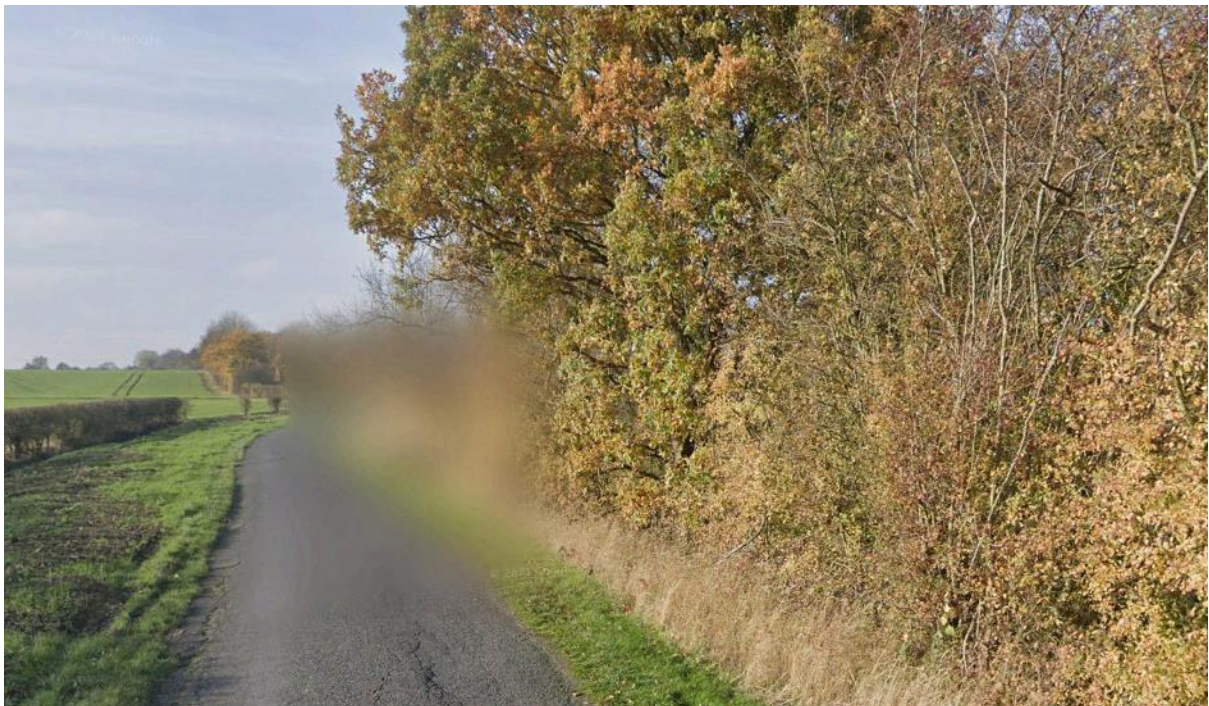
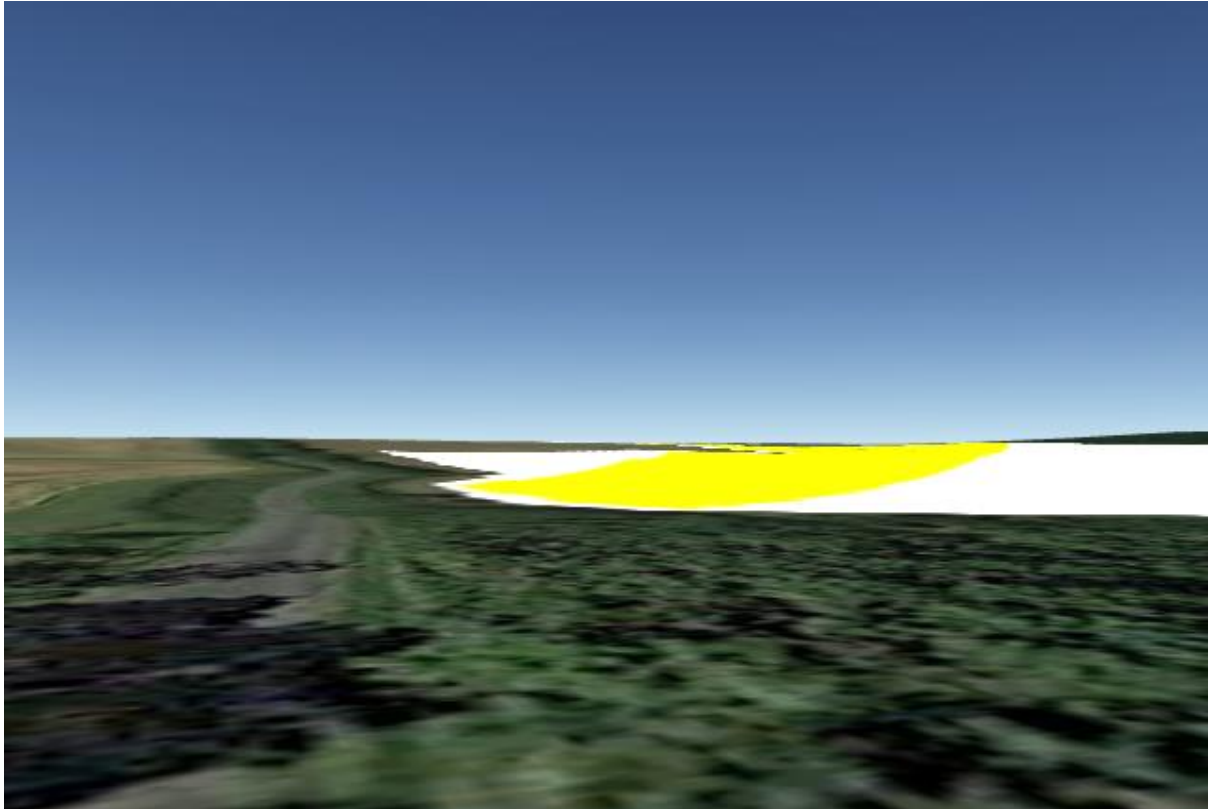


Receptor 75

East Facing

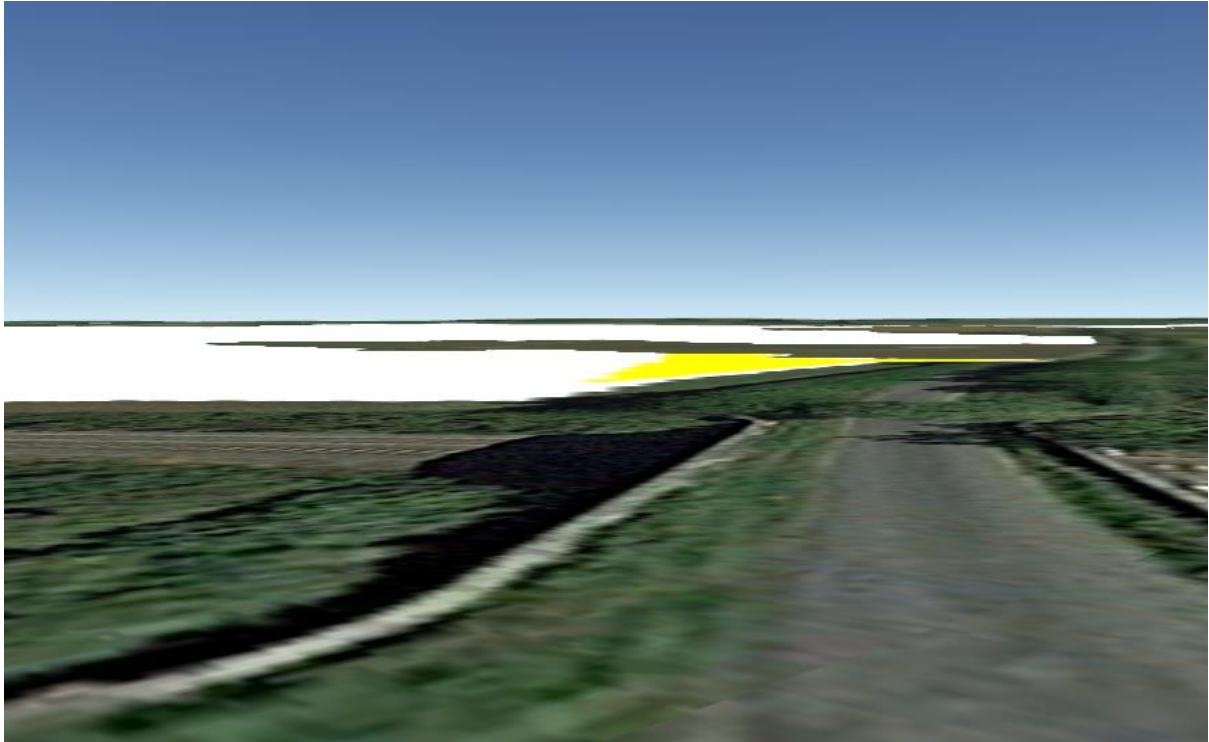


West Facing

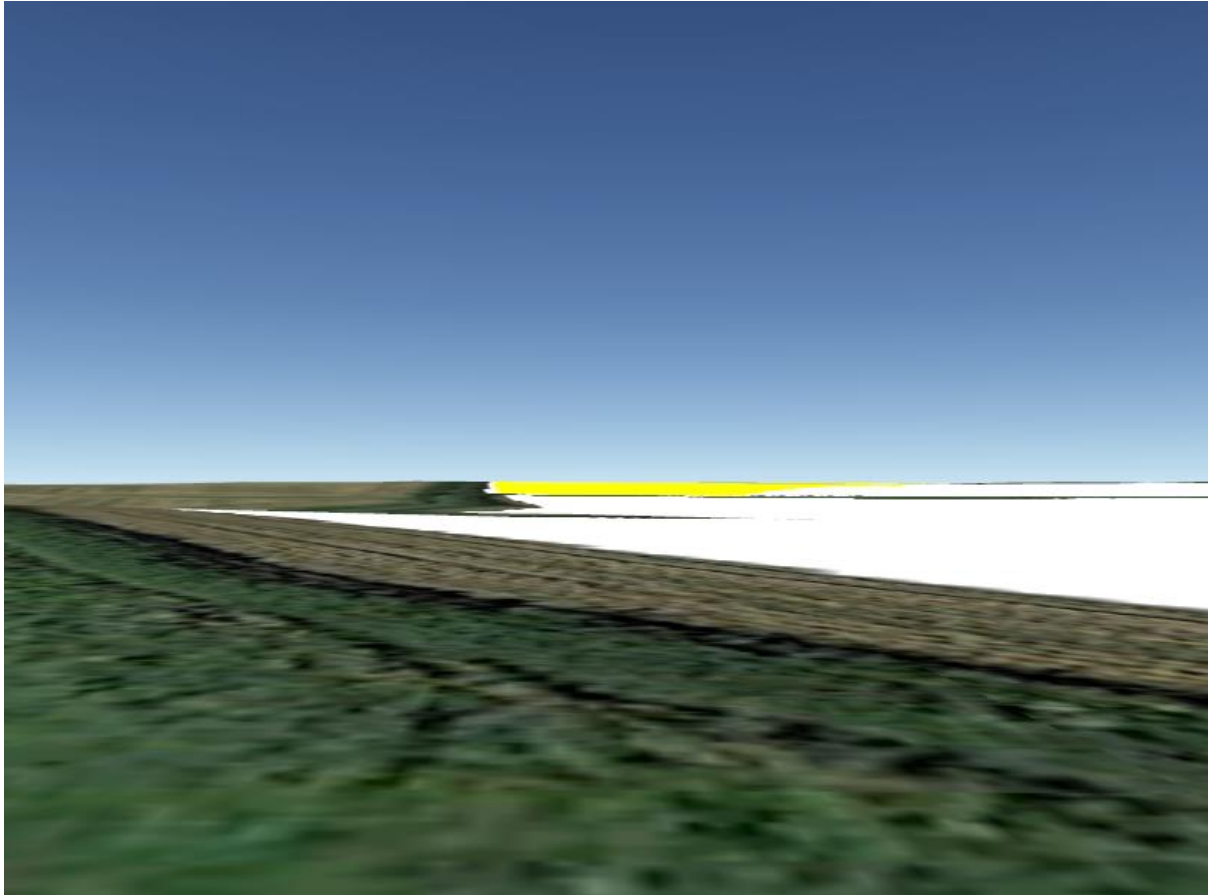


Receptor 76

East Facing

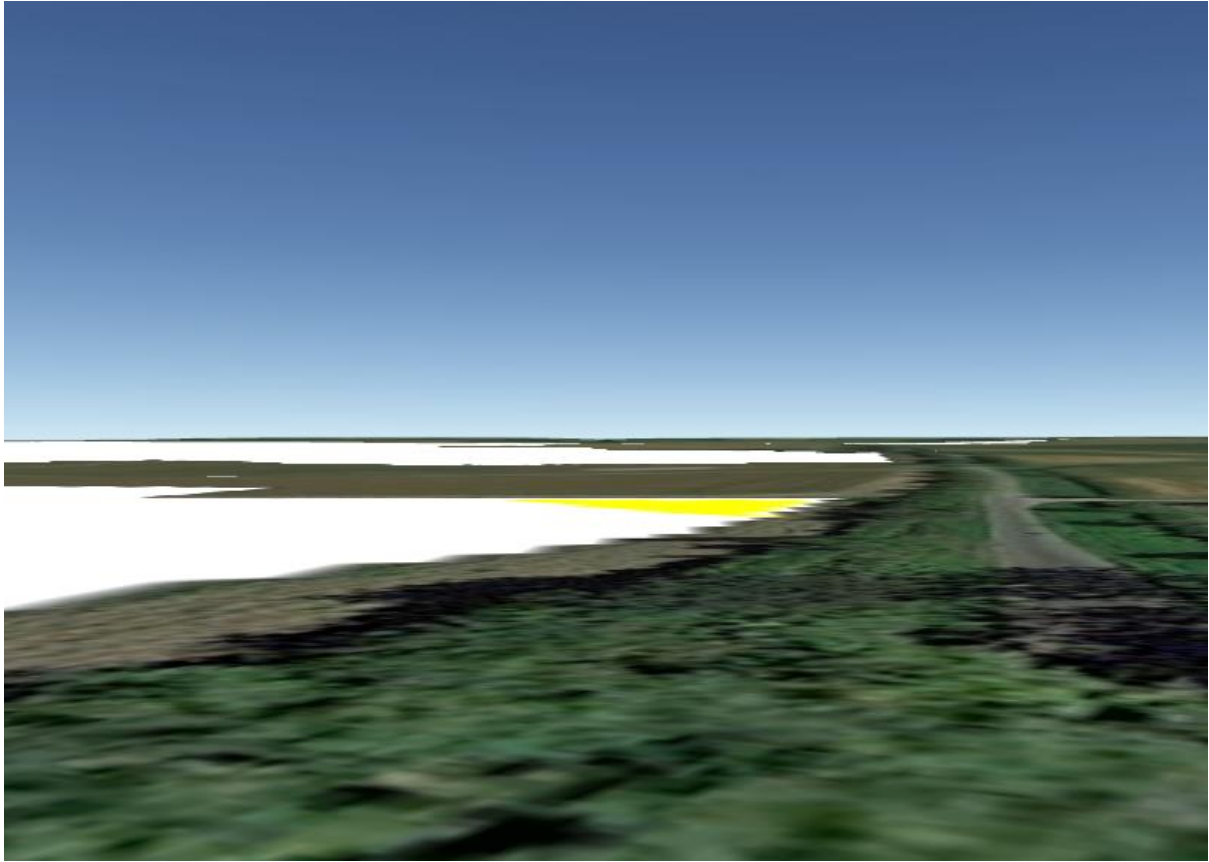


West Facing

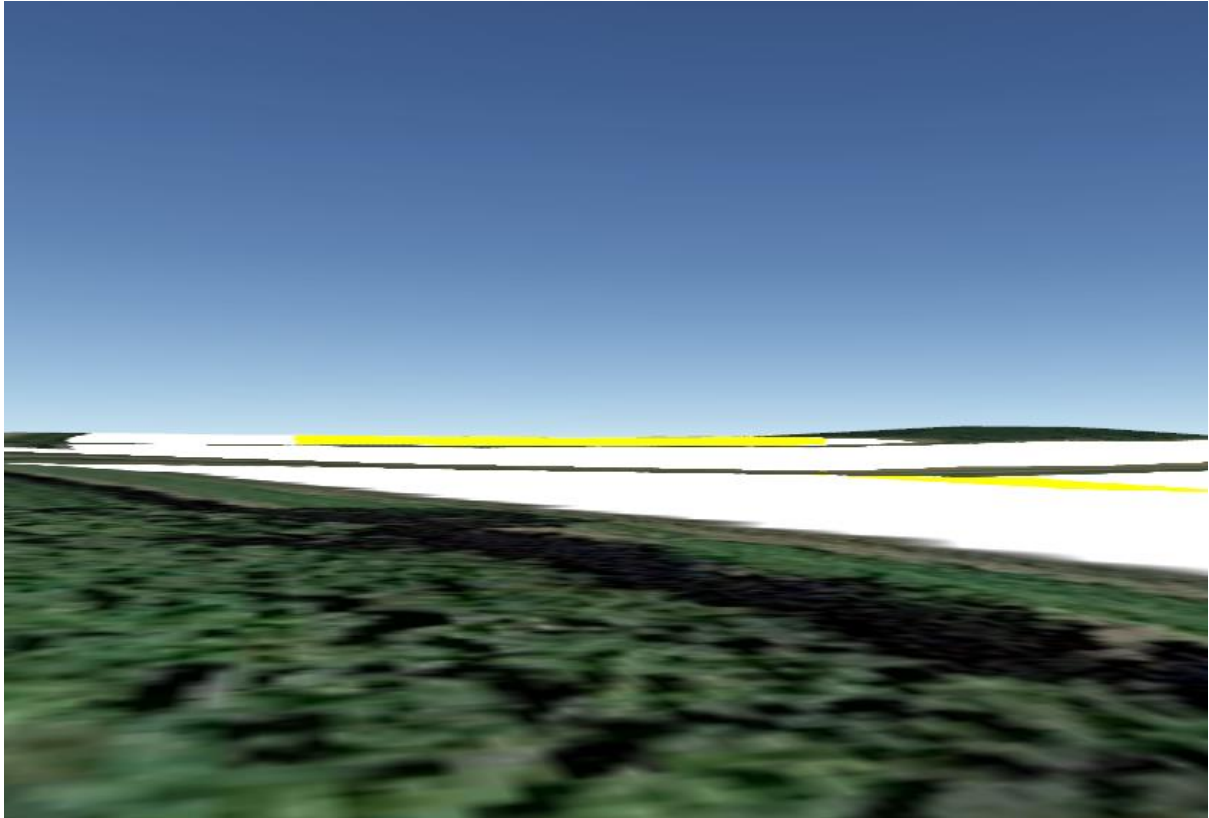


Receptor 77

East Facing

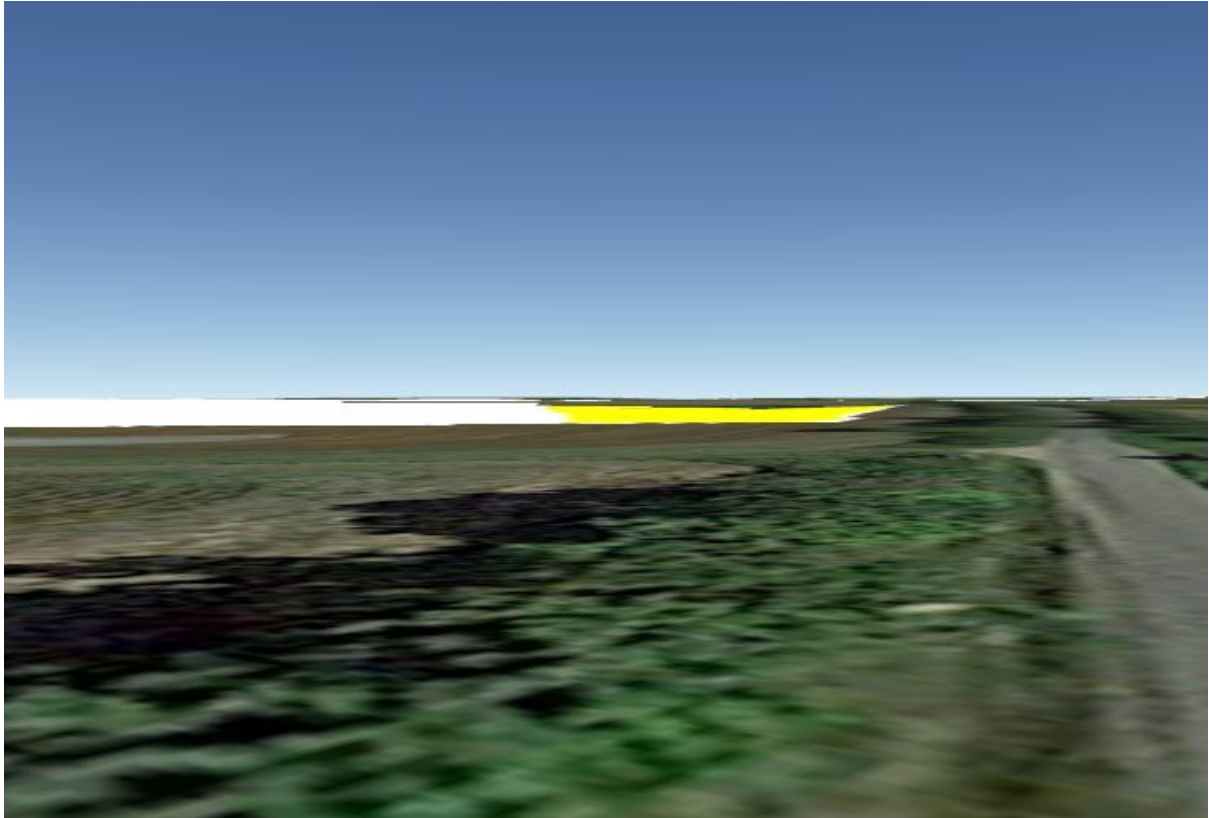


West Facing

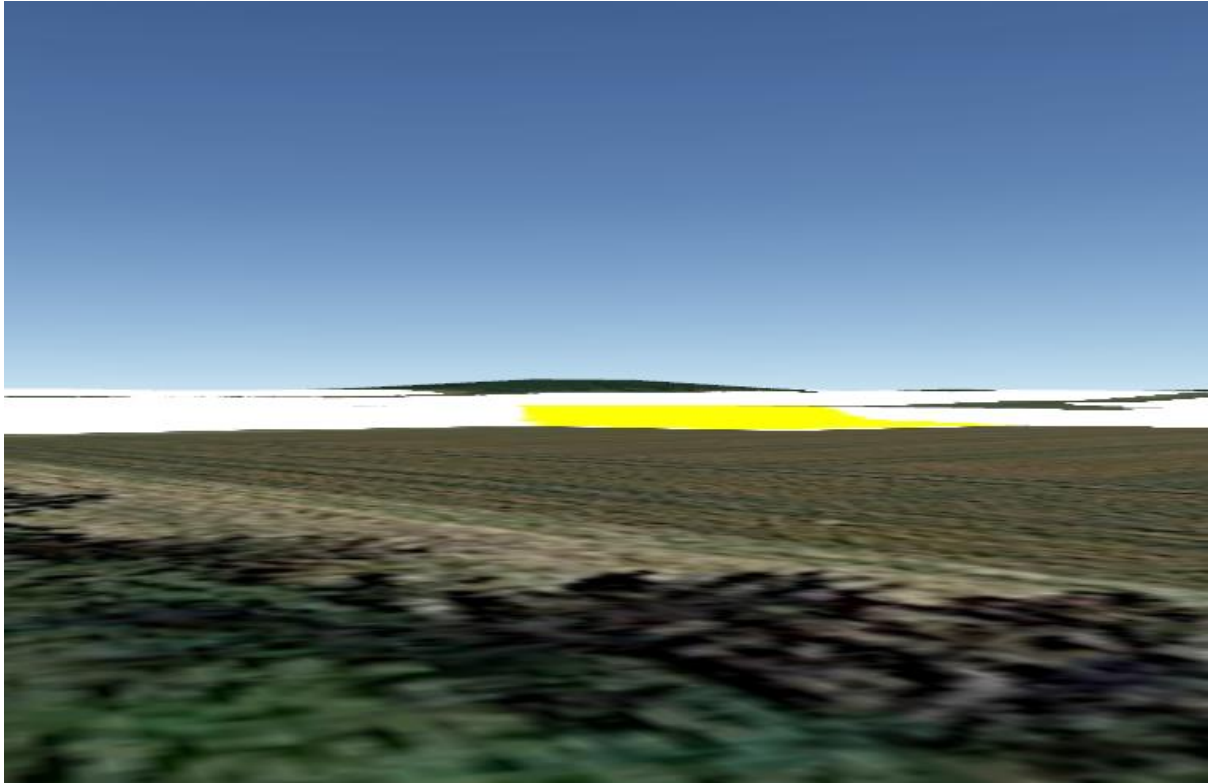


Receptor 78

East Facing

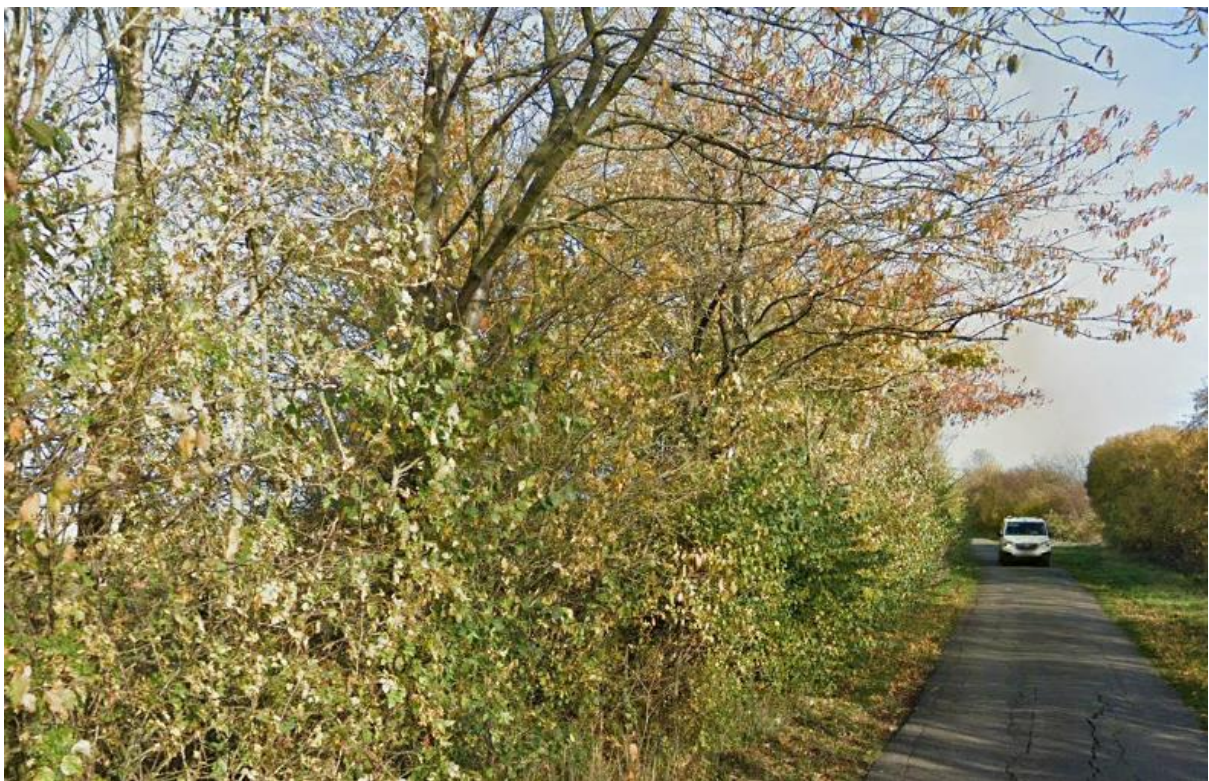
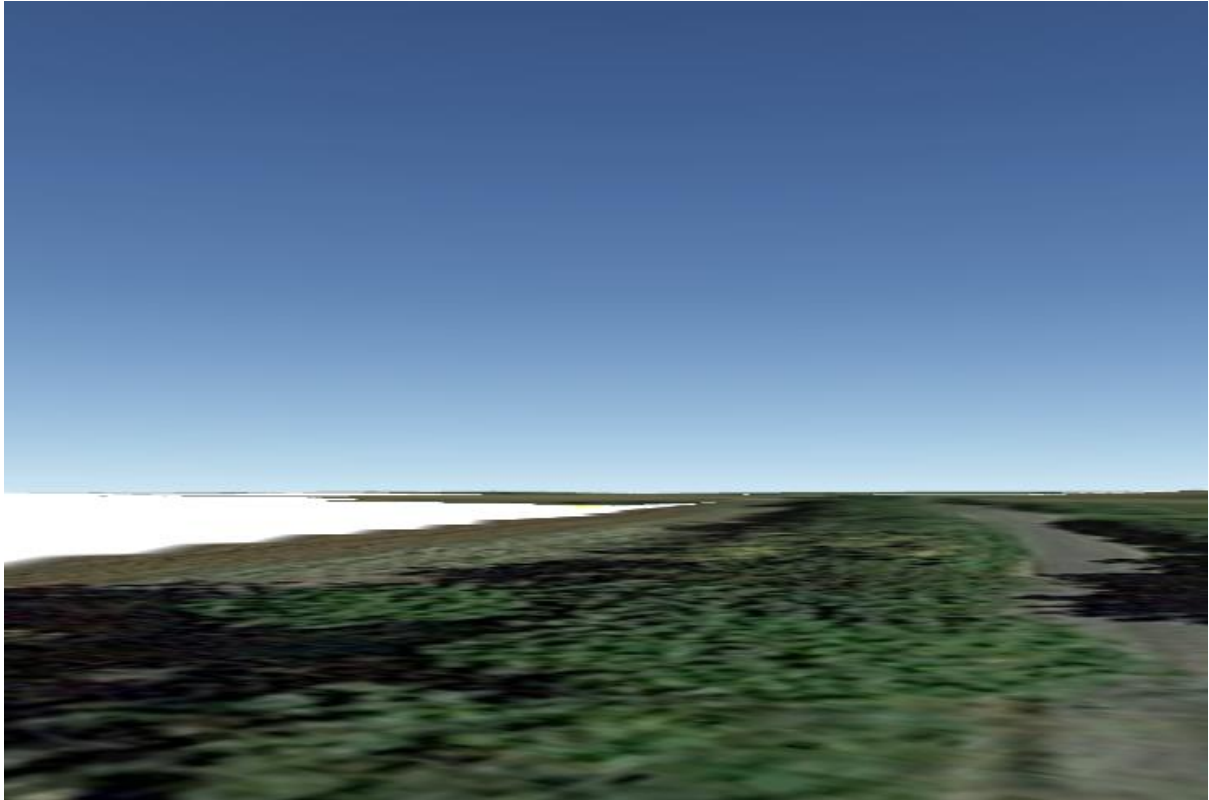


West Facing

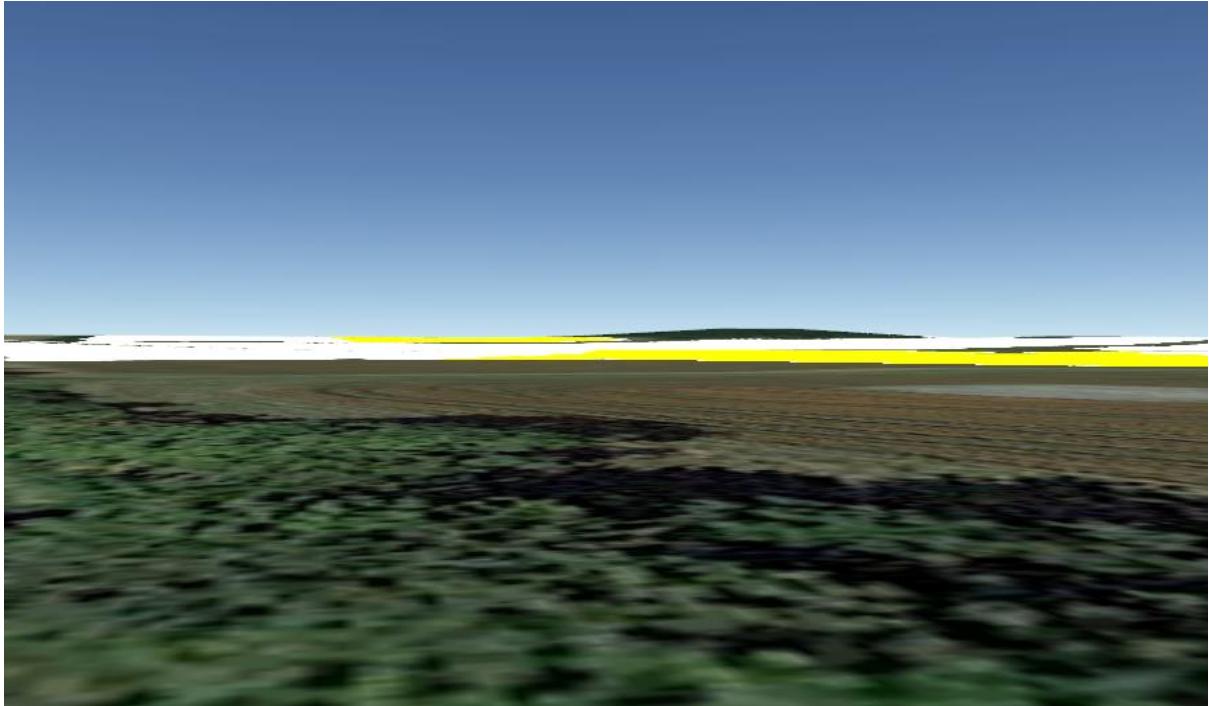


Receptor 79

East Facing

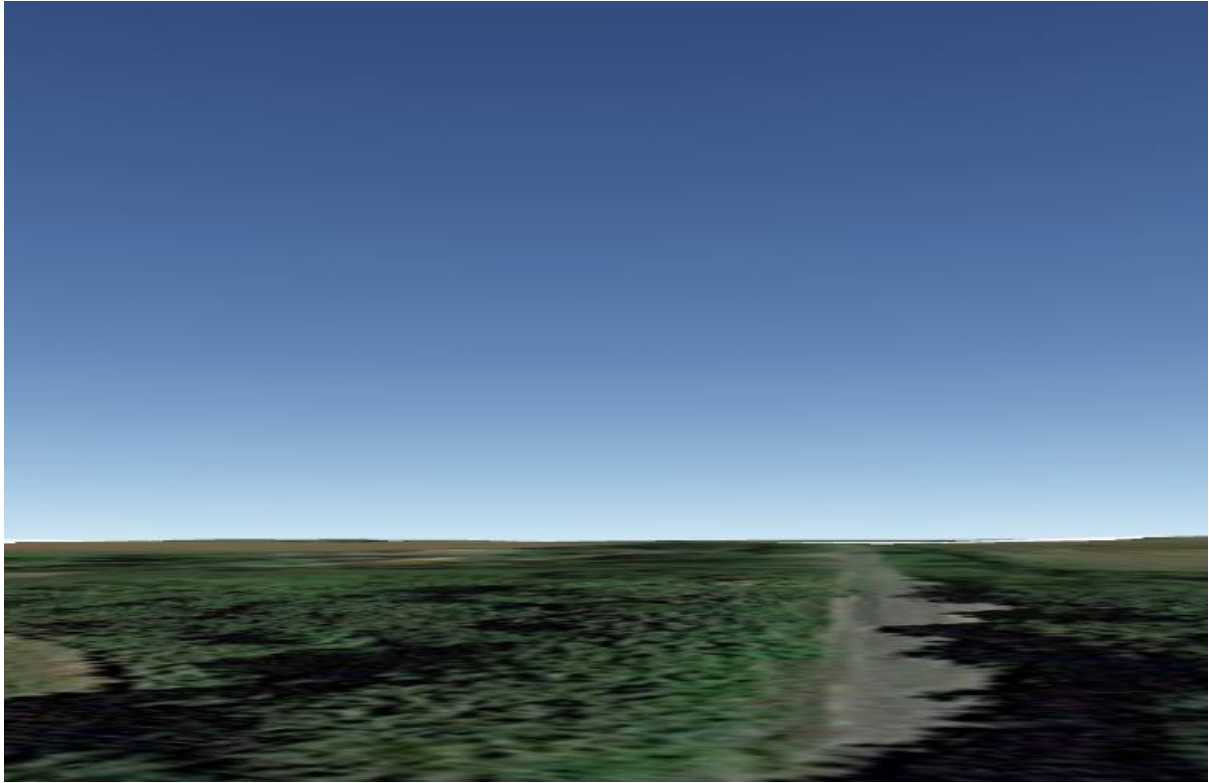


West Facing

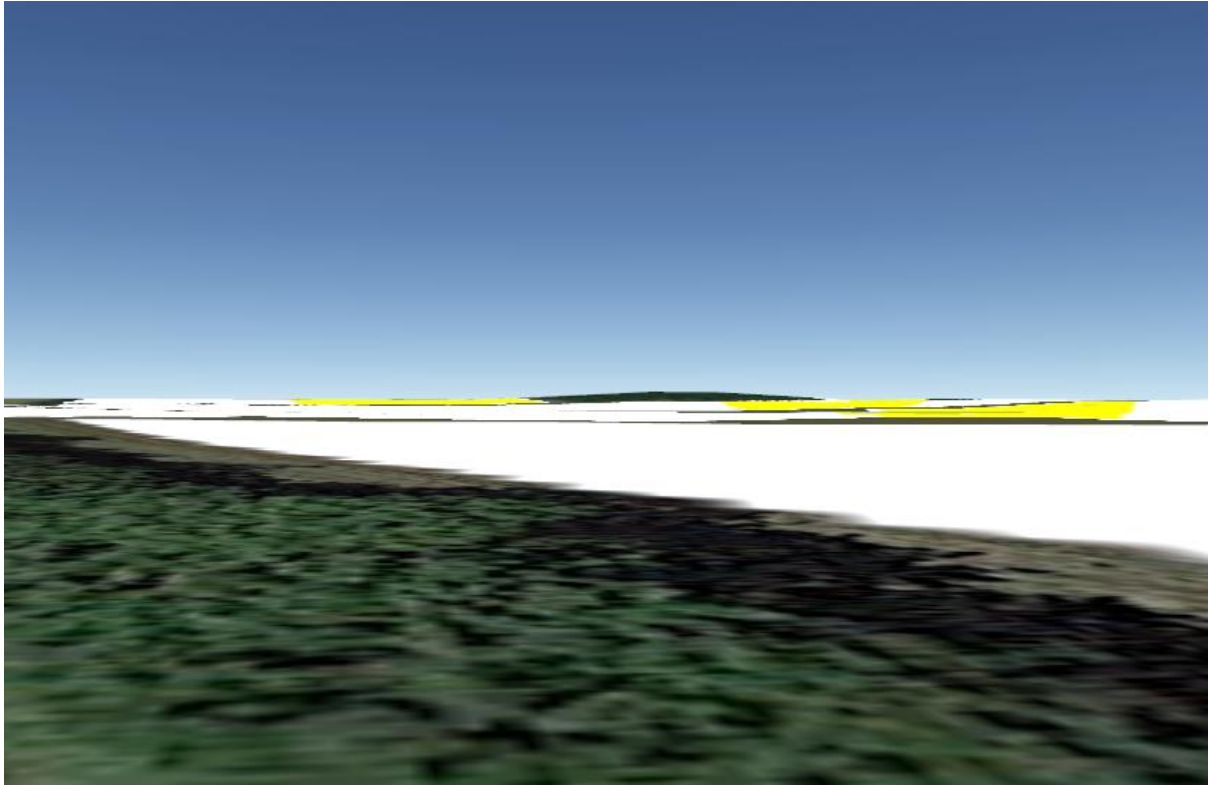


Receptor 80

East Facing

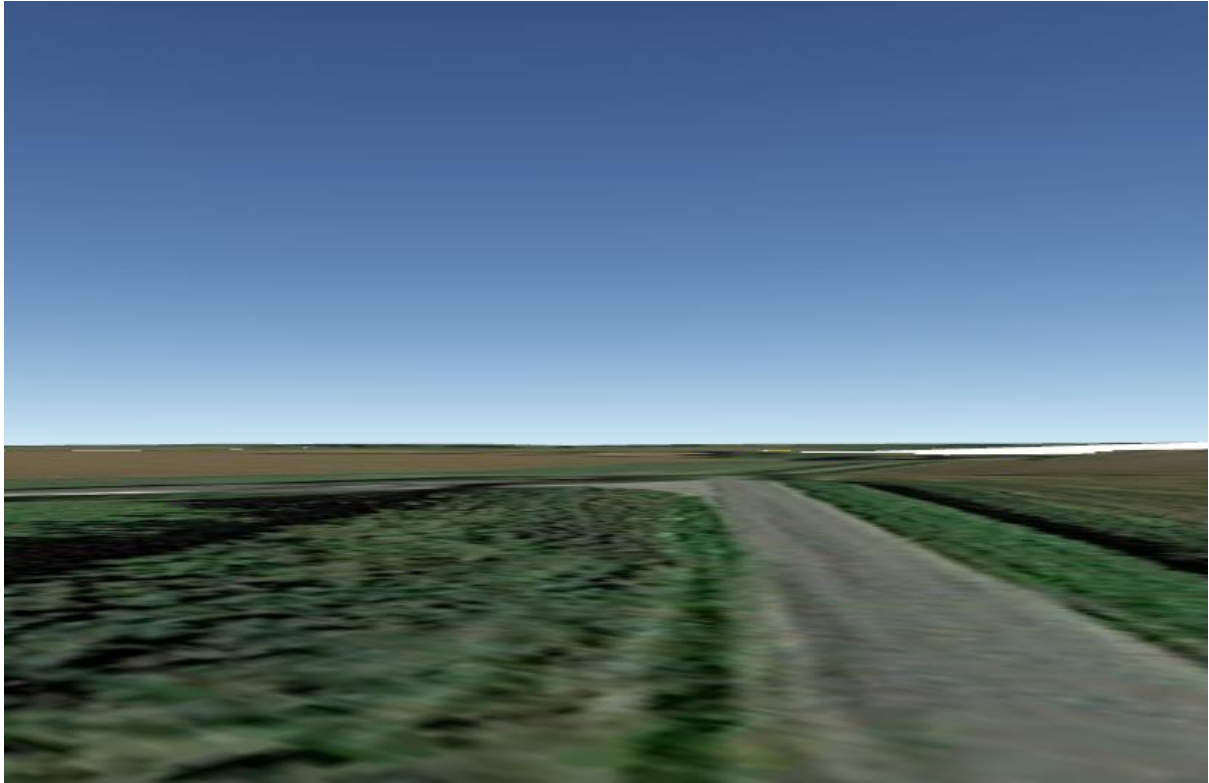


West Facing

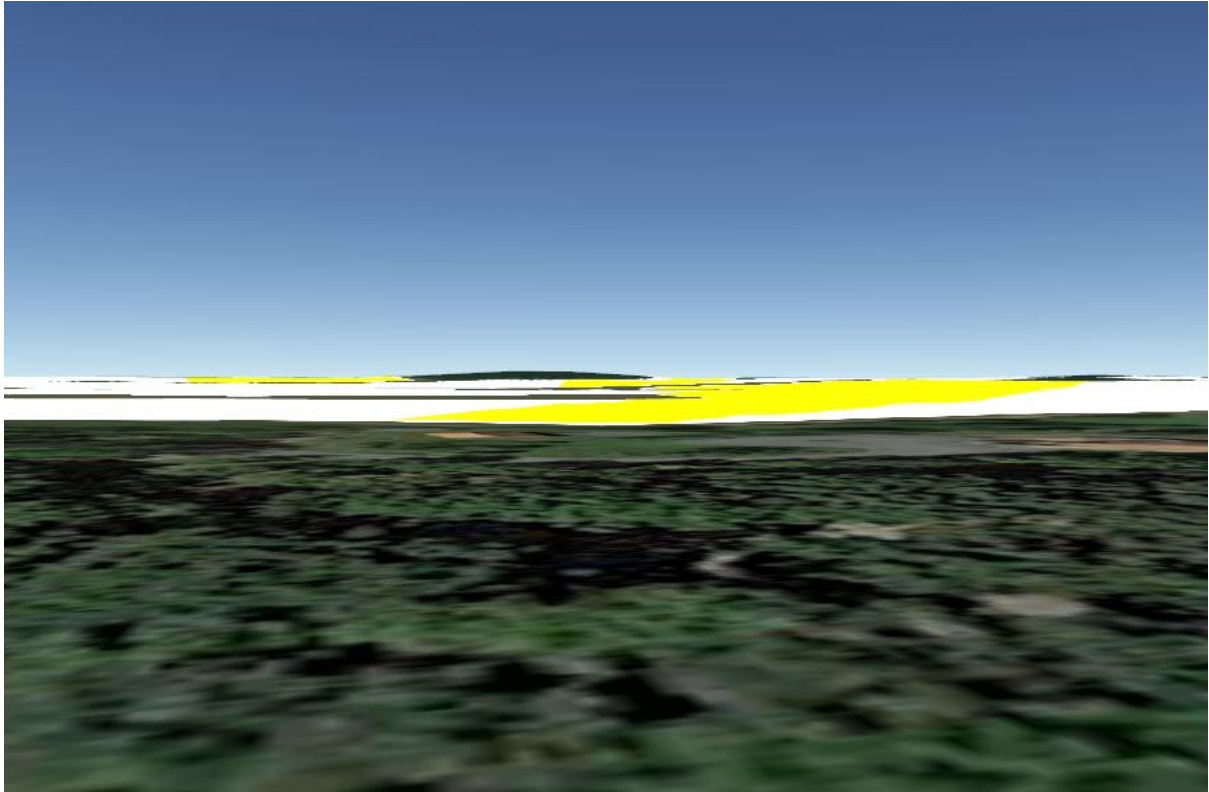


Receptor 81

East Facing

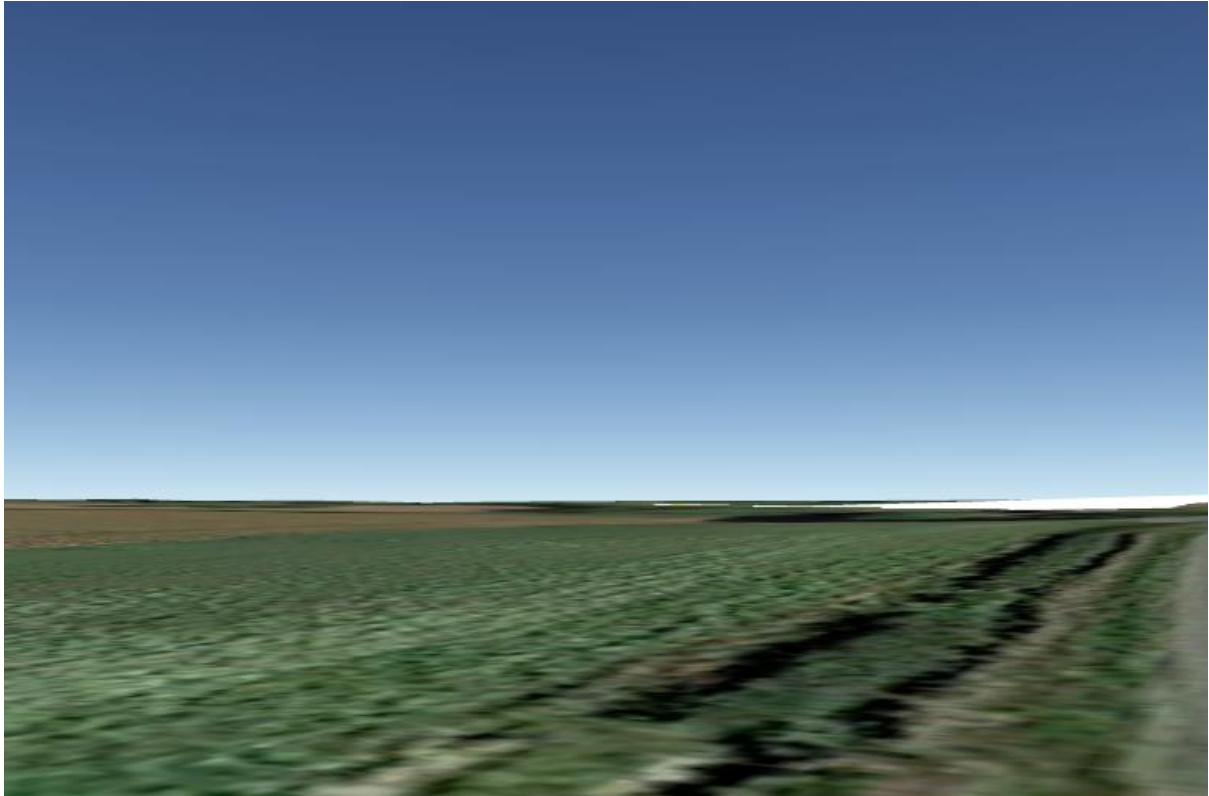


West Facing

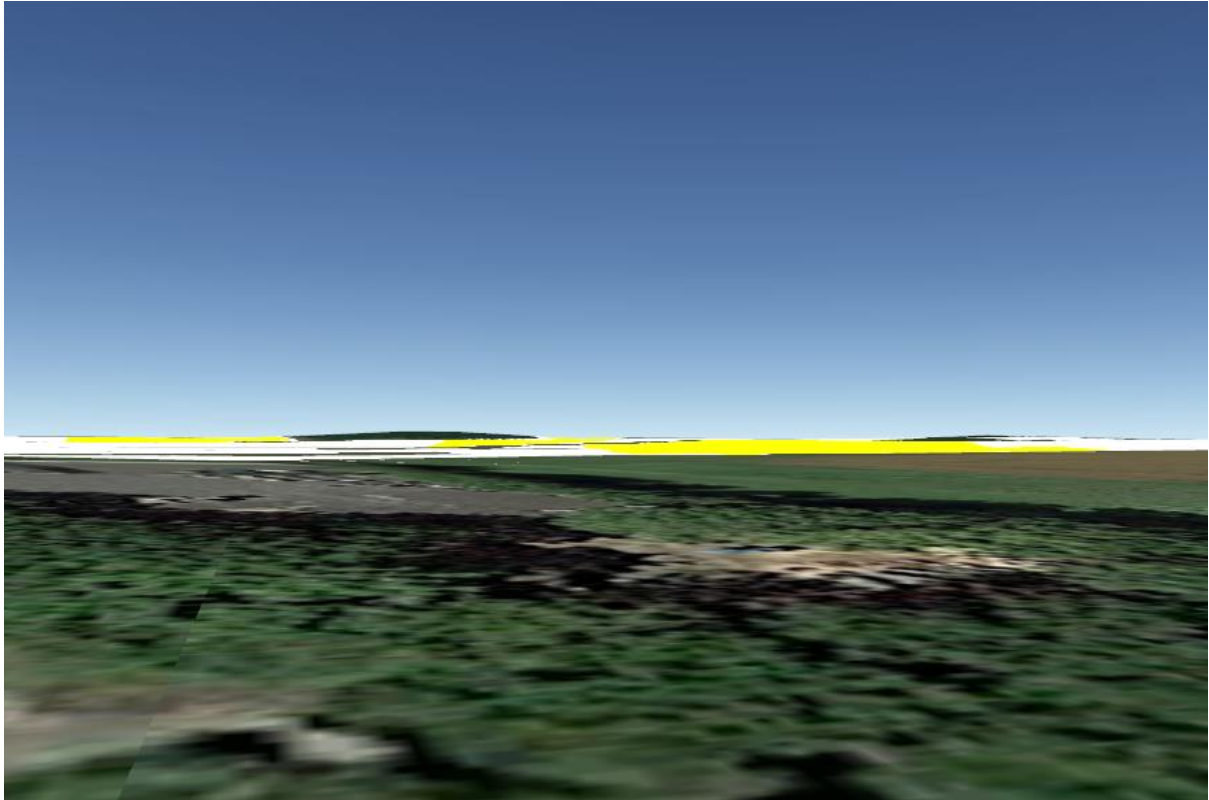


Receptor 82

East Facing

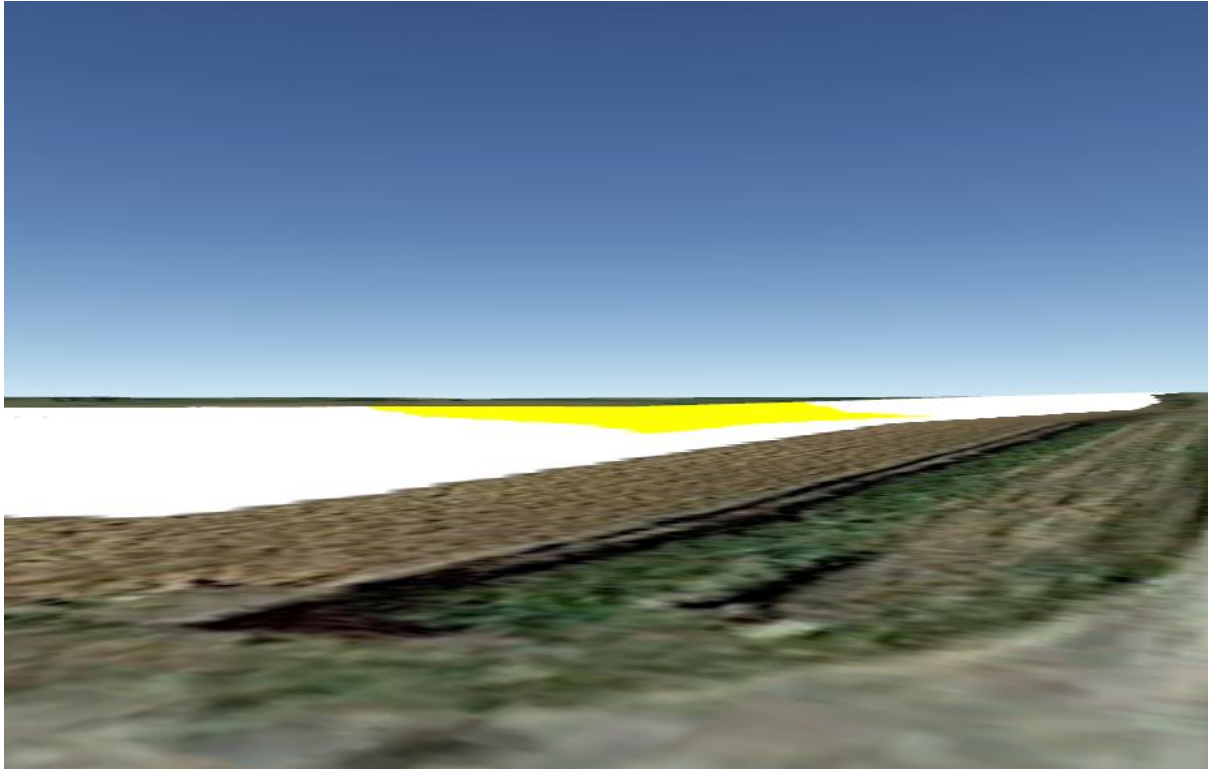


West Facing

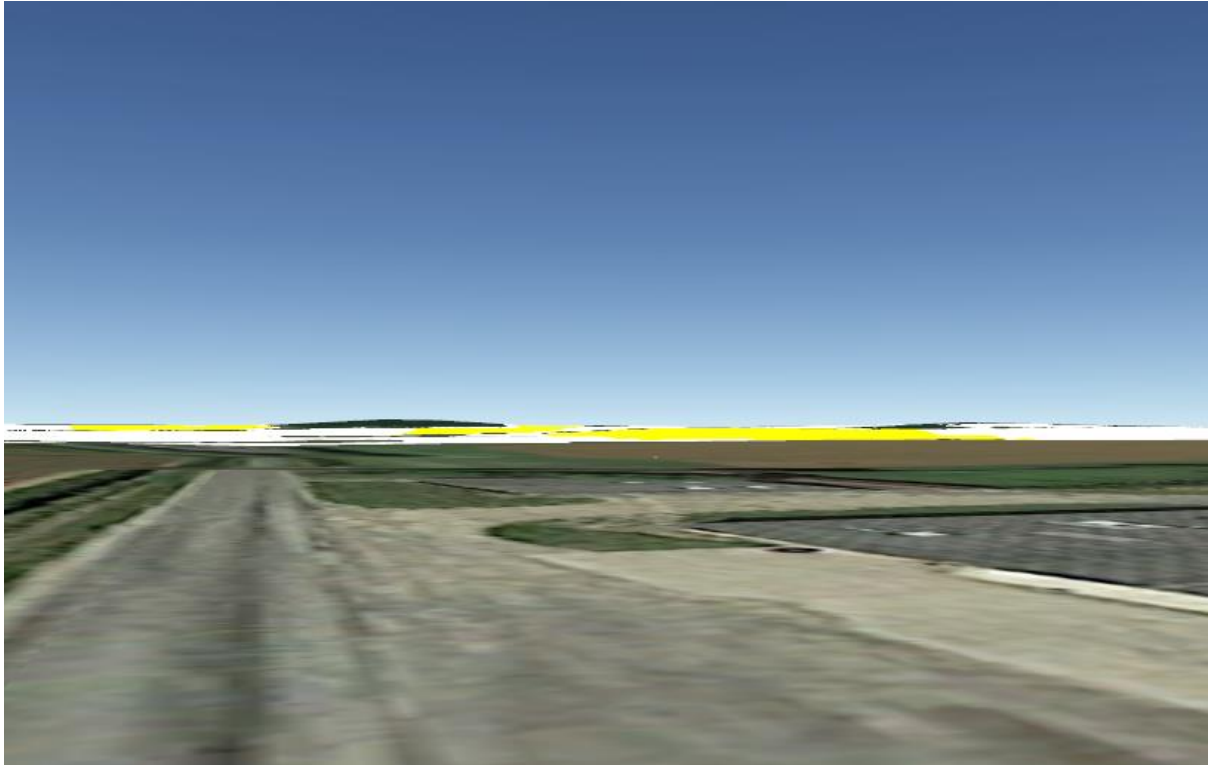


Receptor 83

East Facing

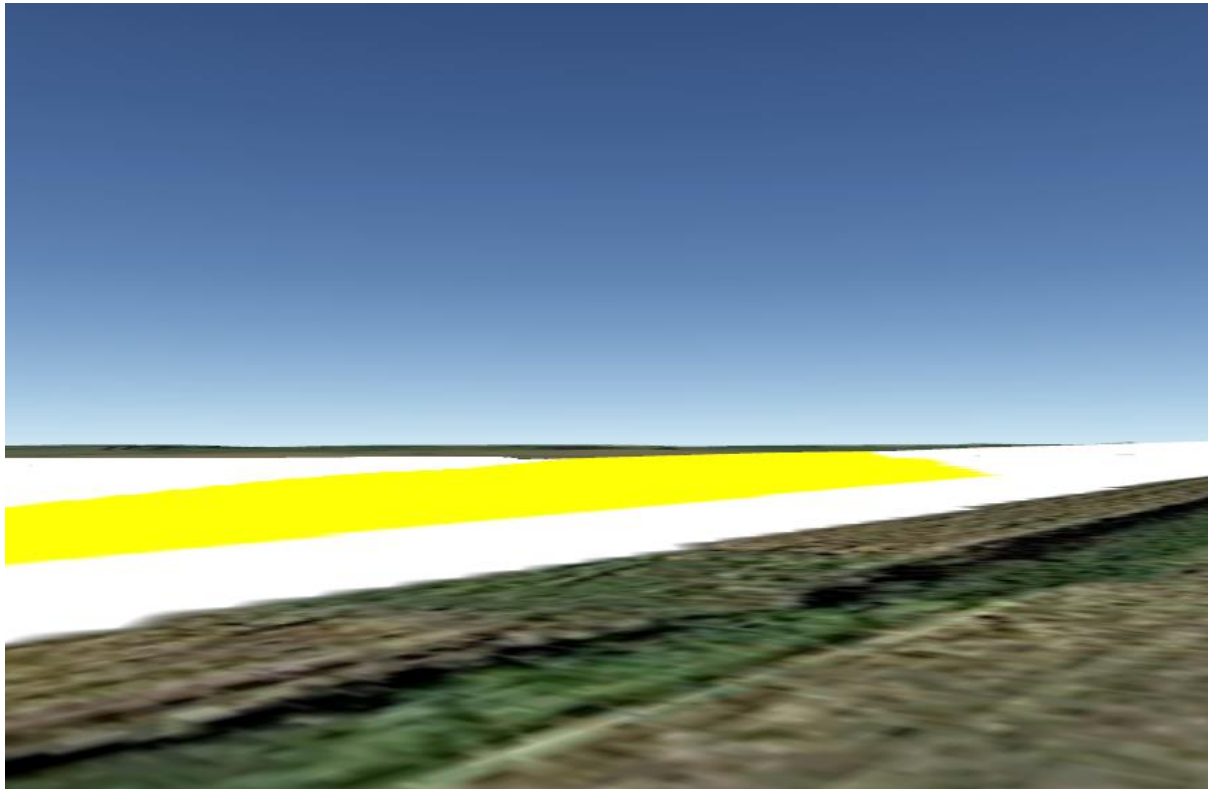


West Facing

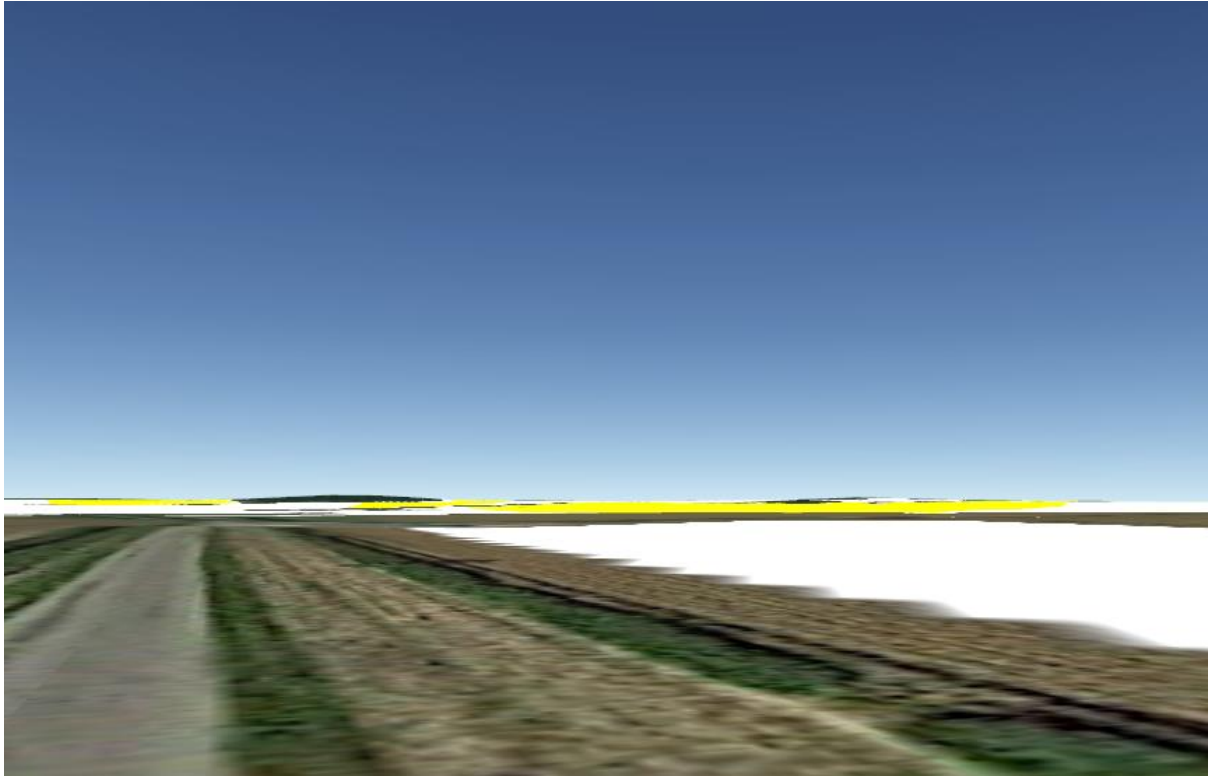


Receptor 84

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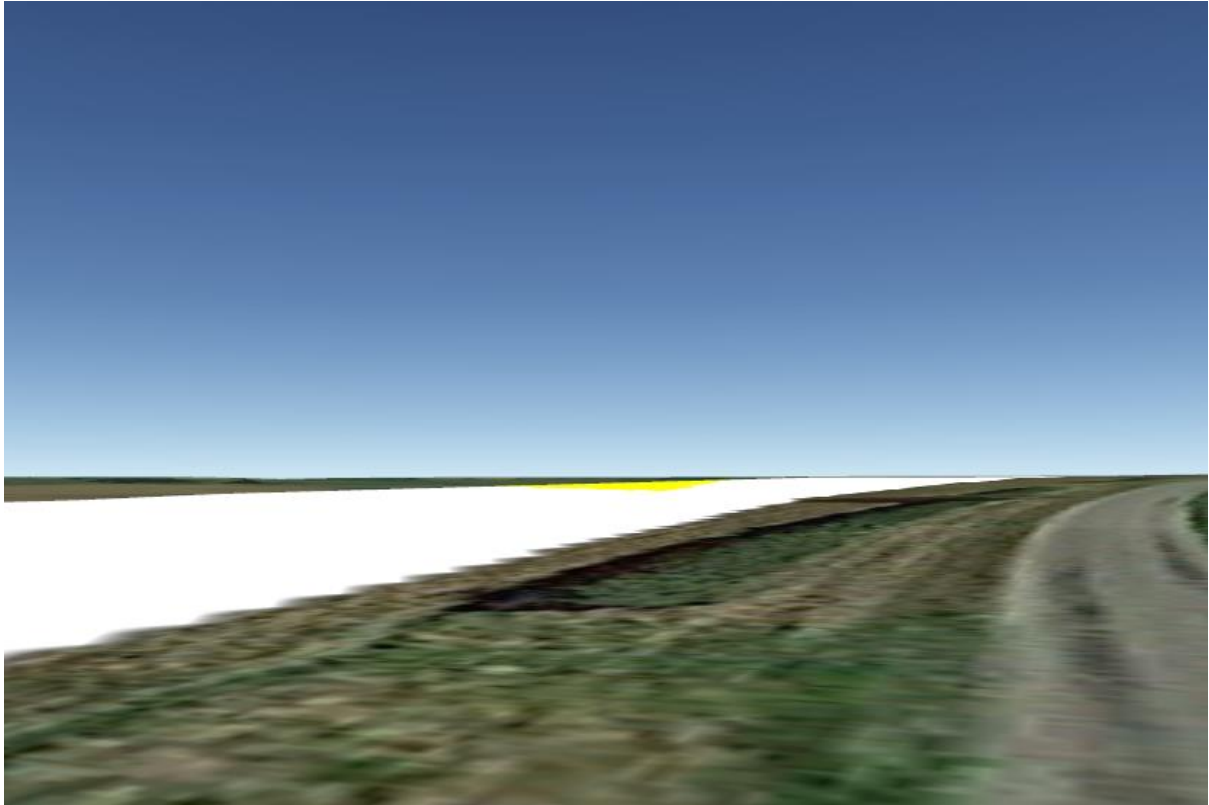


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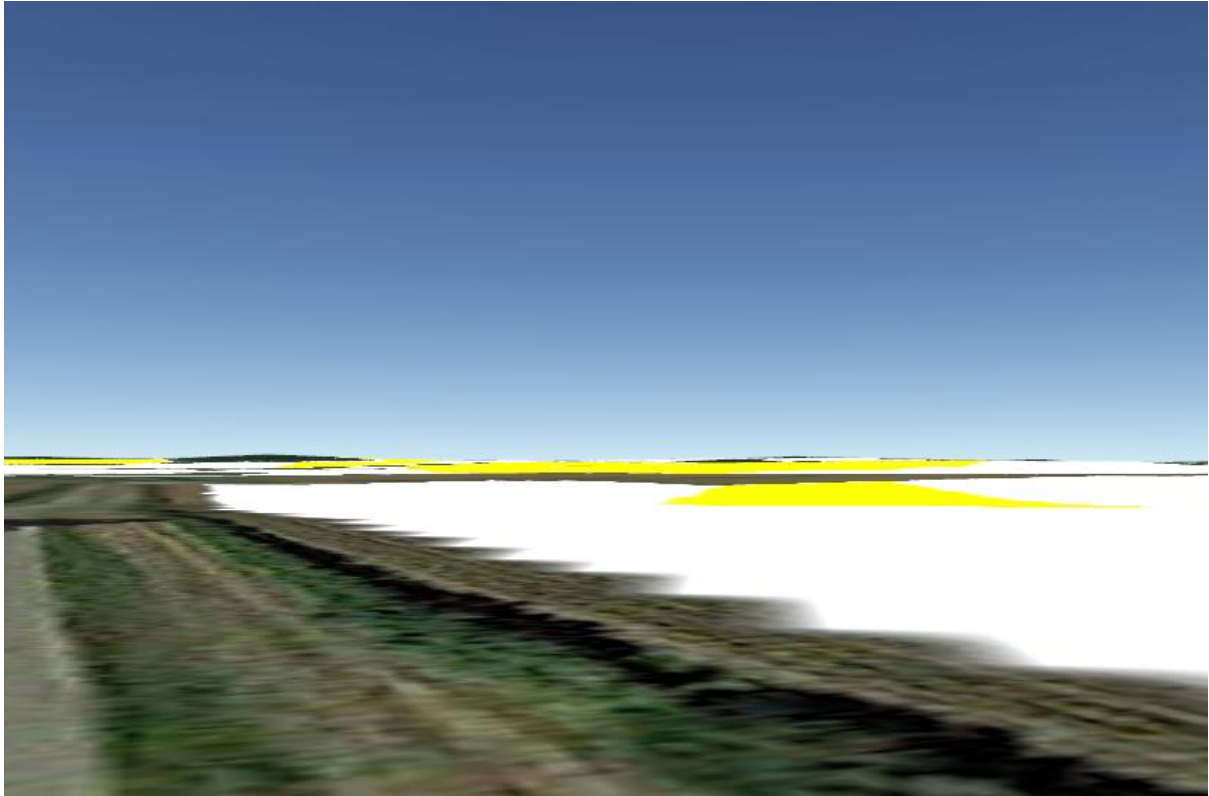


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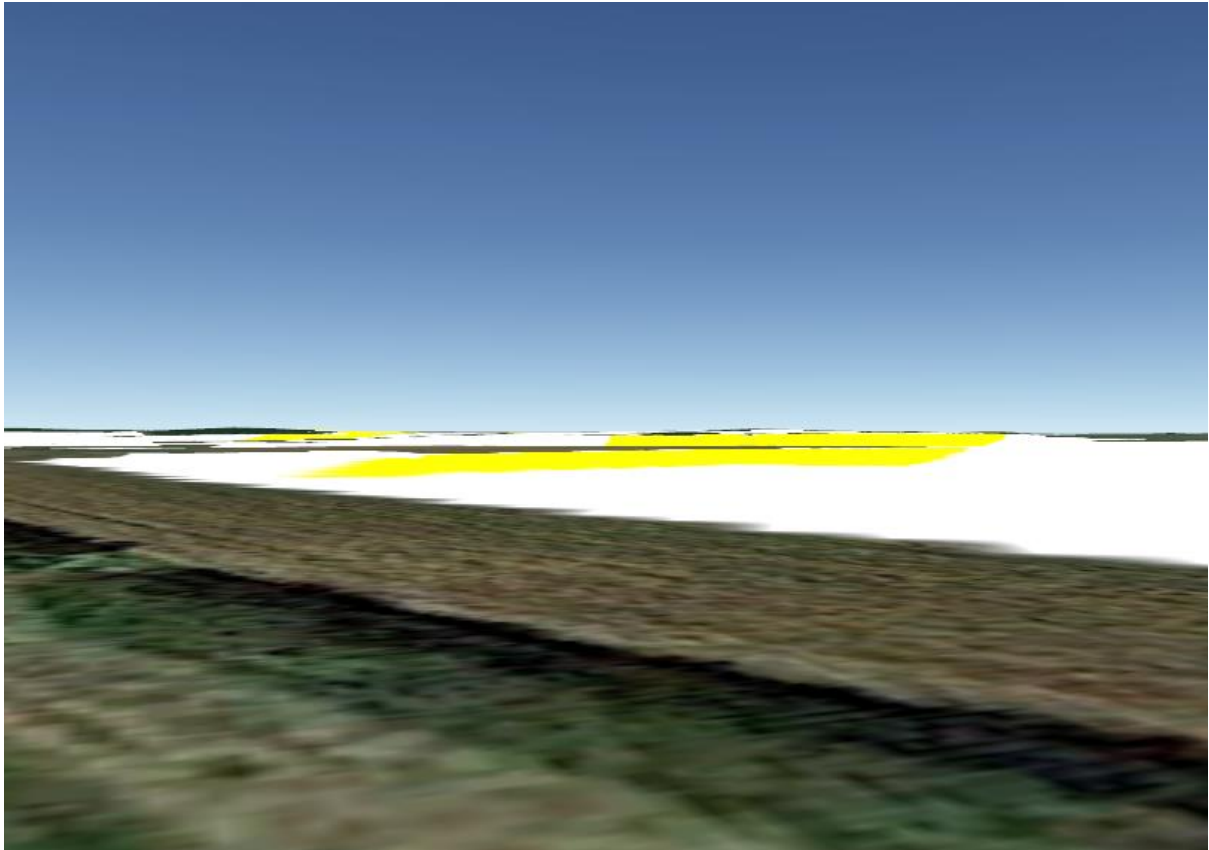
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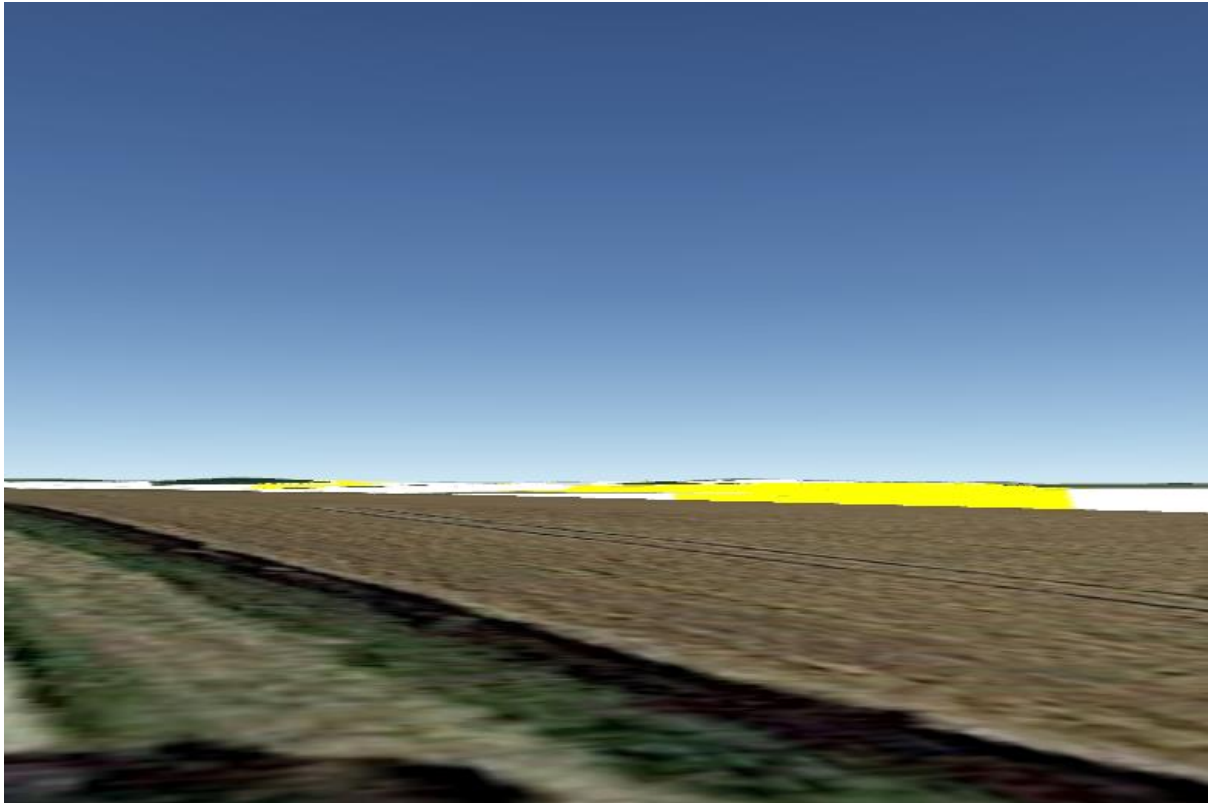
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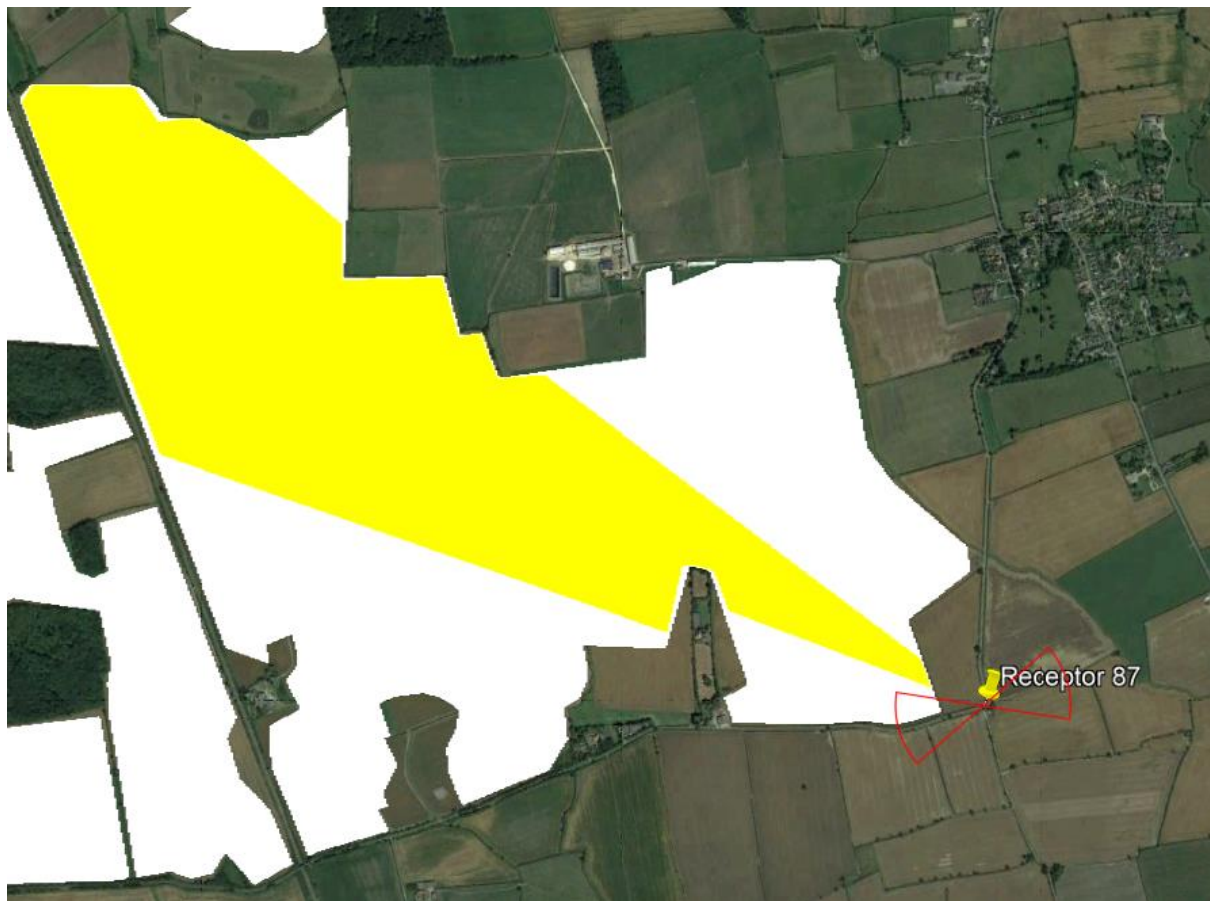


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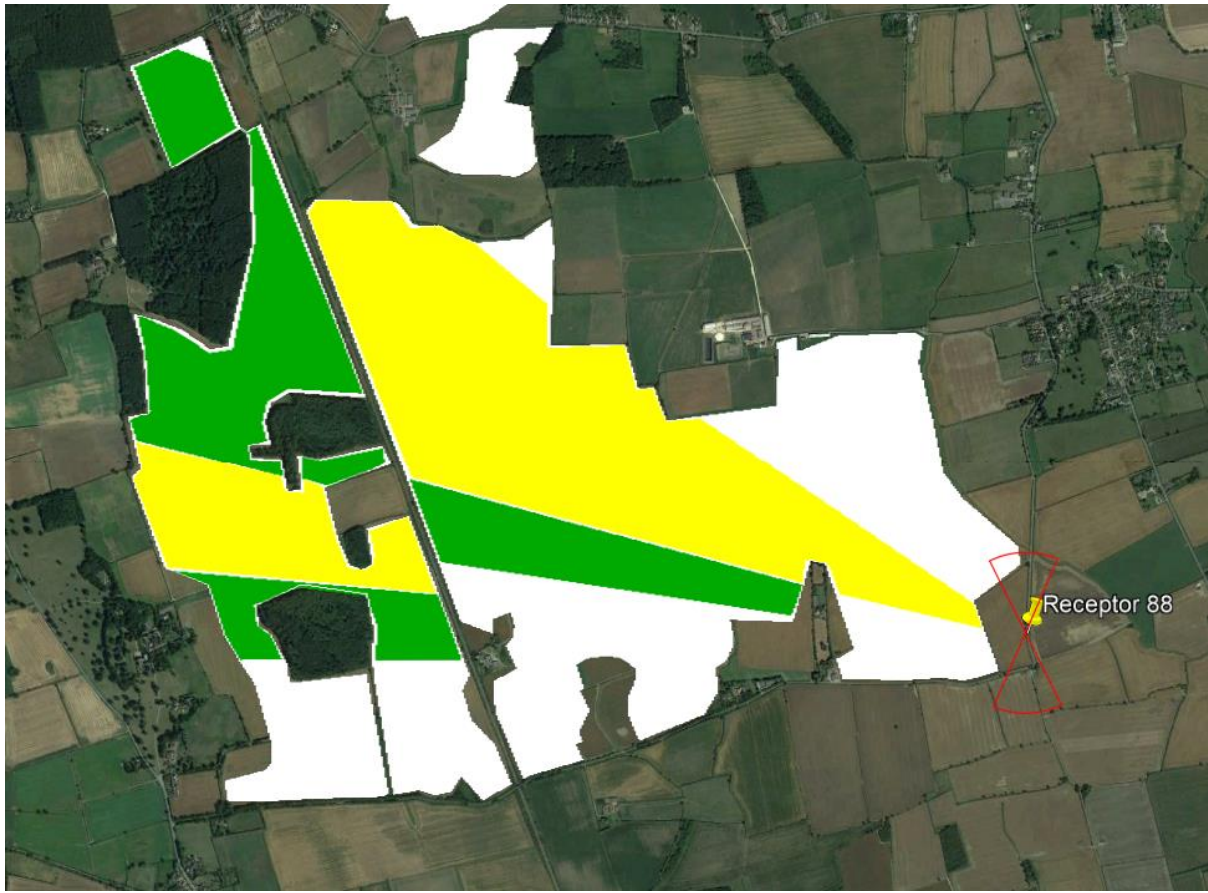


Receptor 87





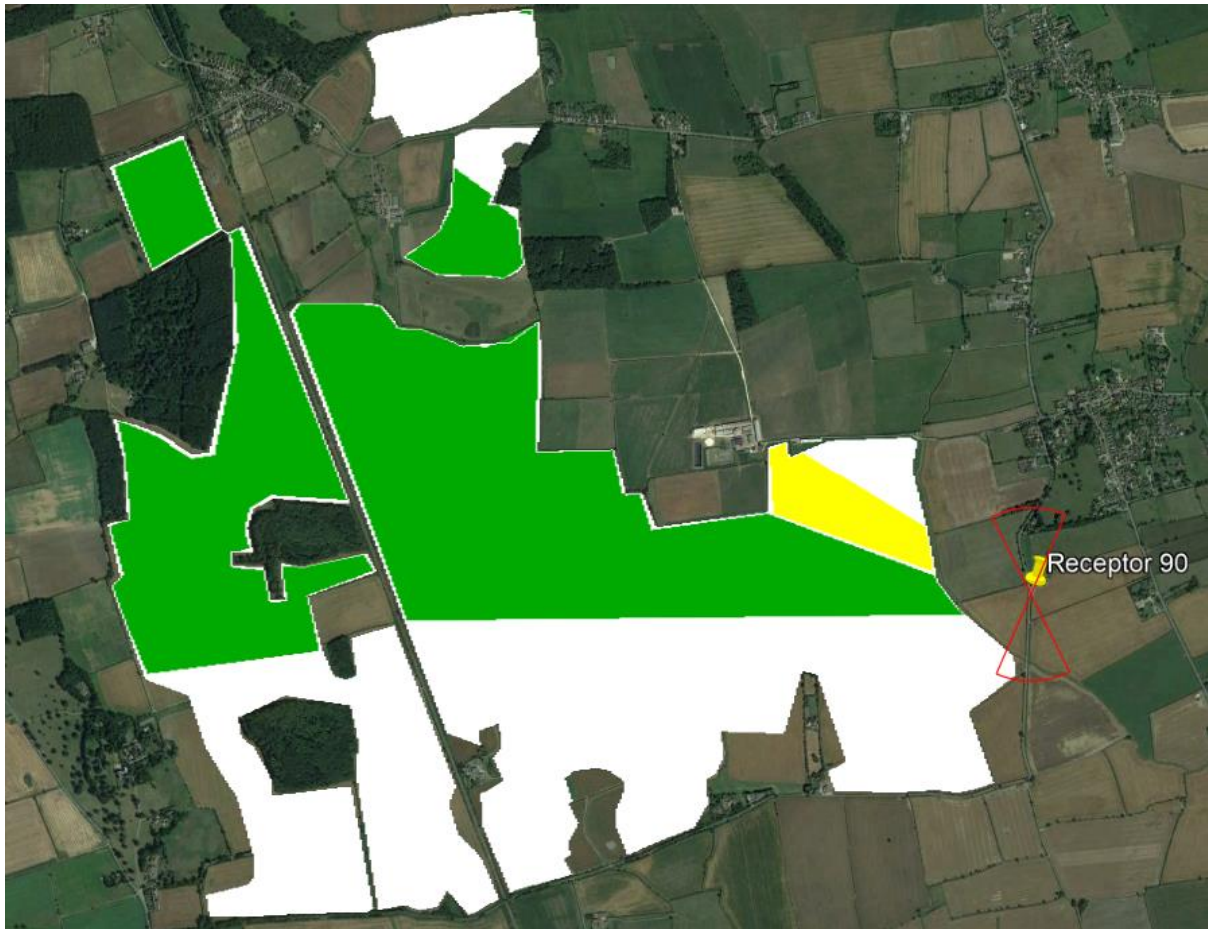
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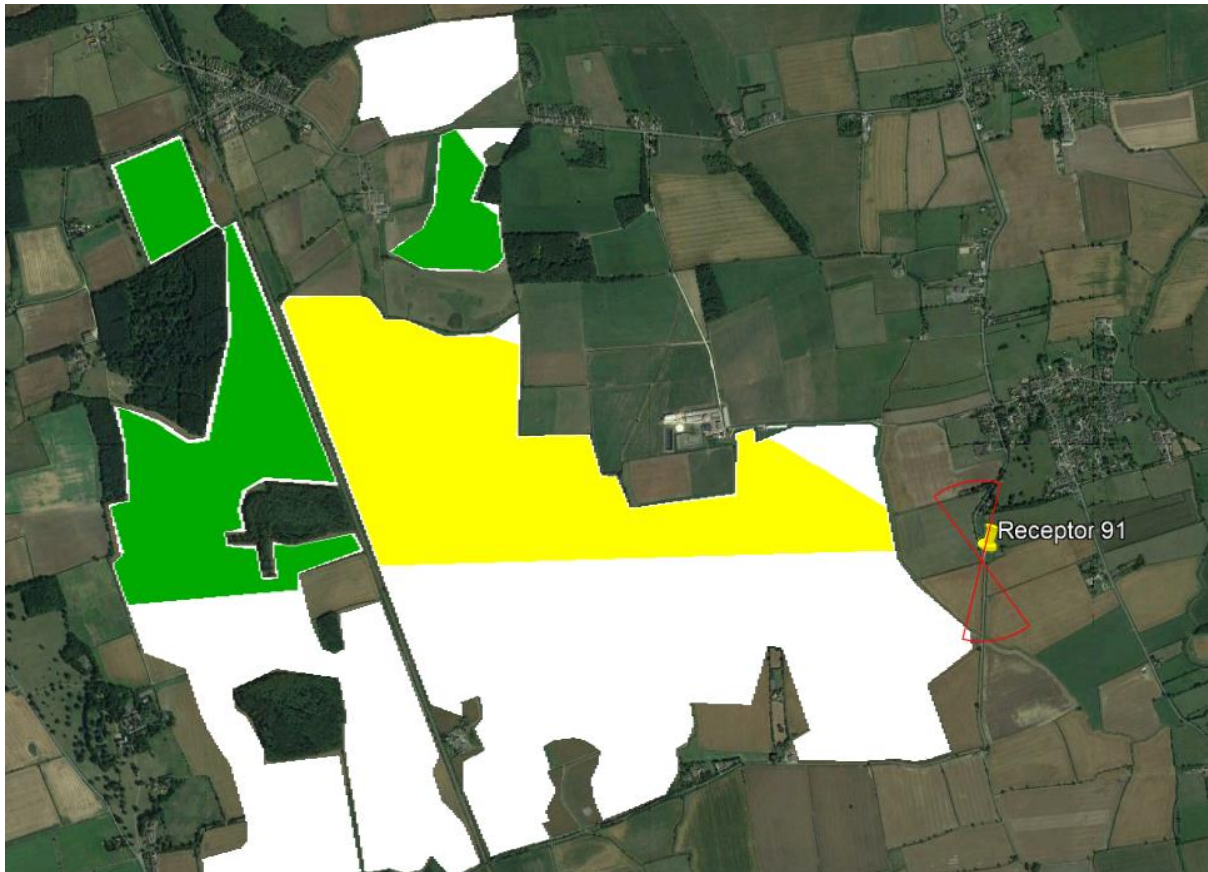
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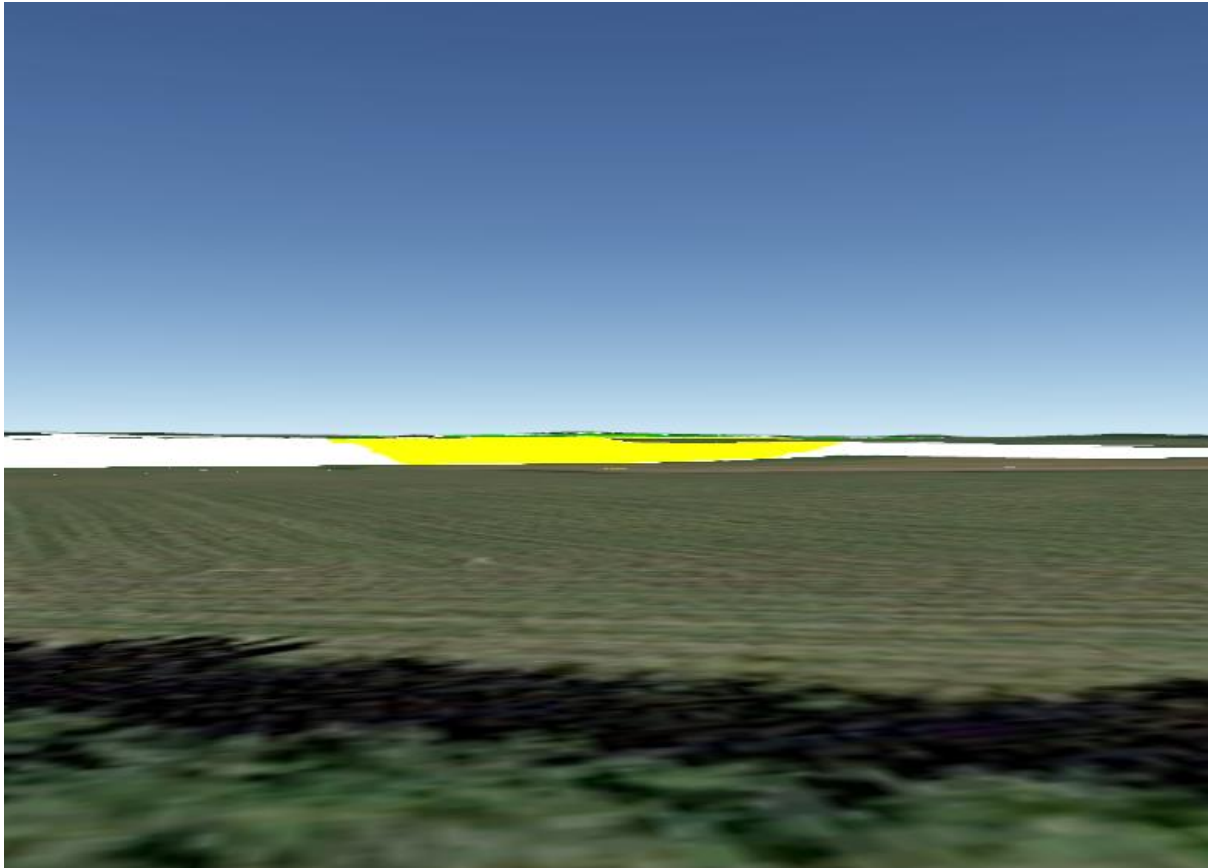
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Receptor 91



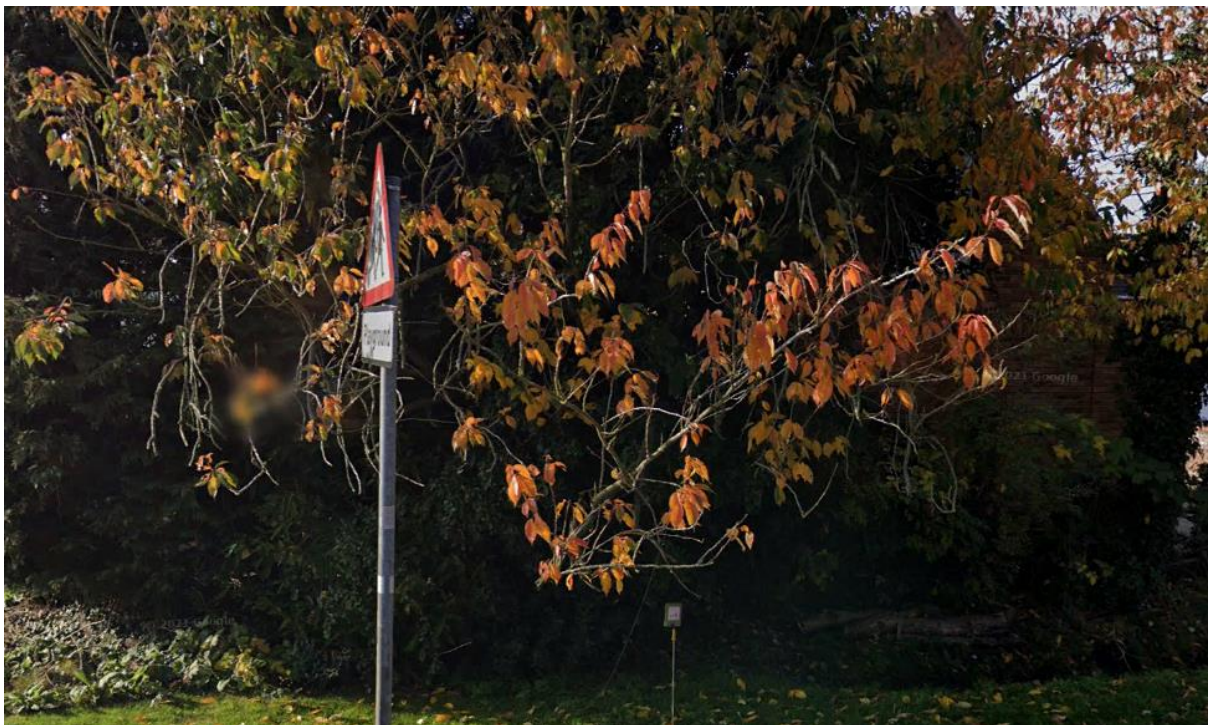
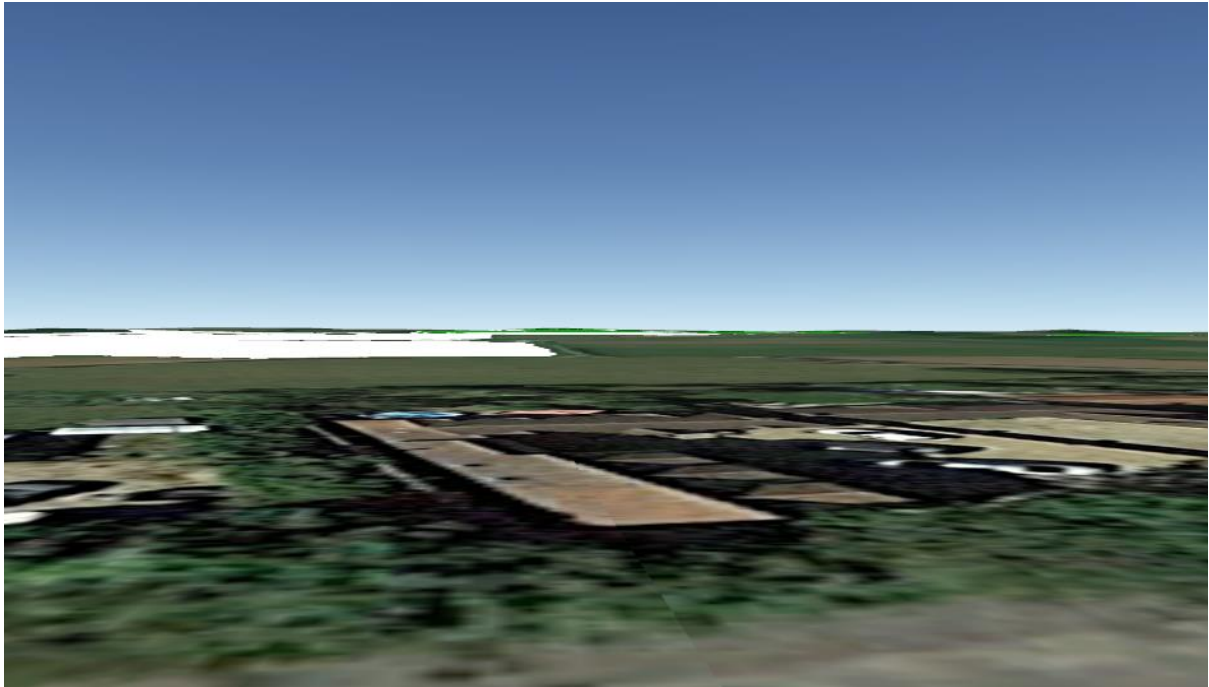
Receptor 92



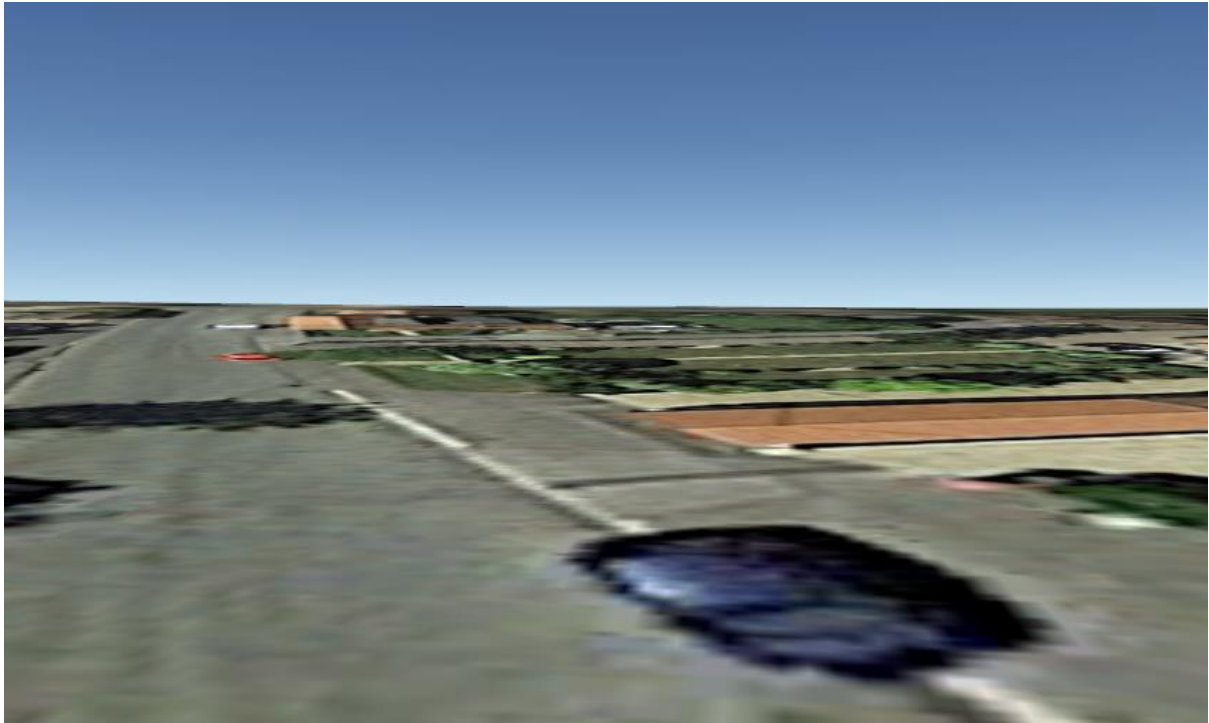
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Receptor 94



Receptor 95

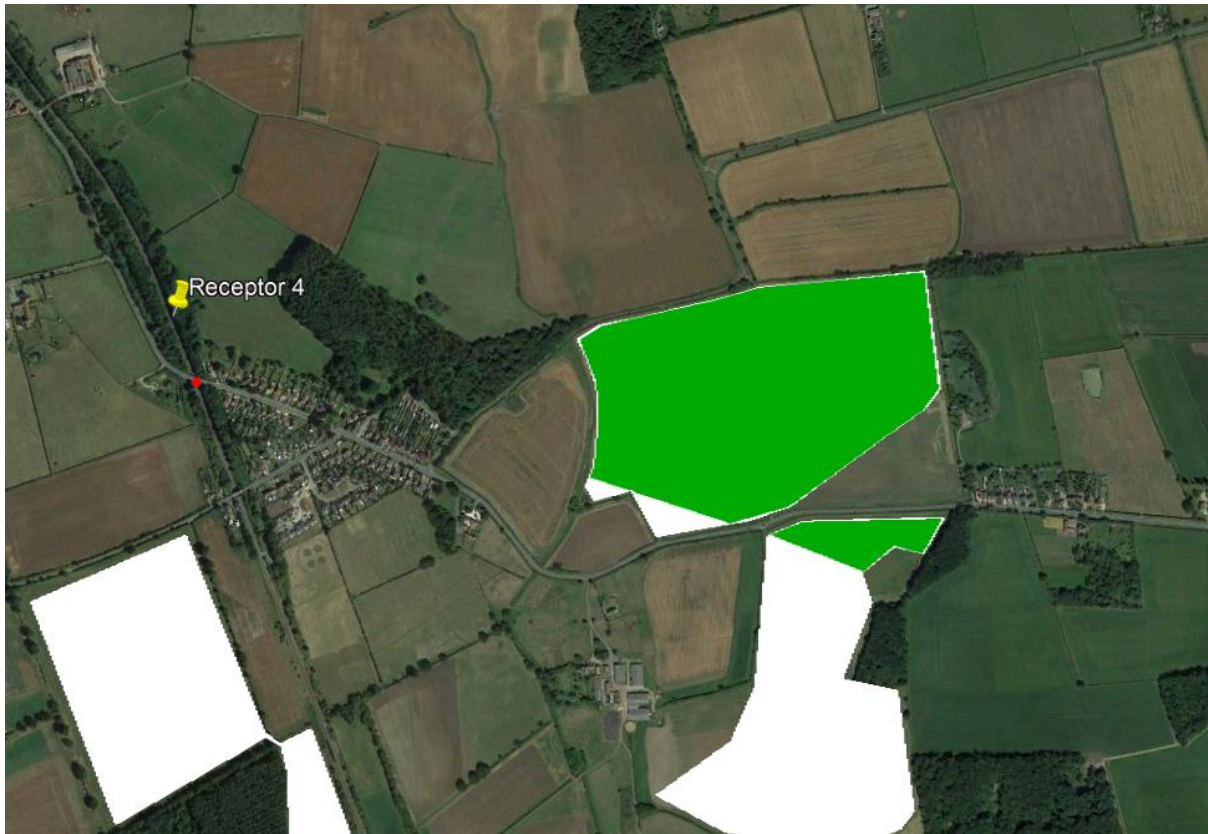


Rail Receptors

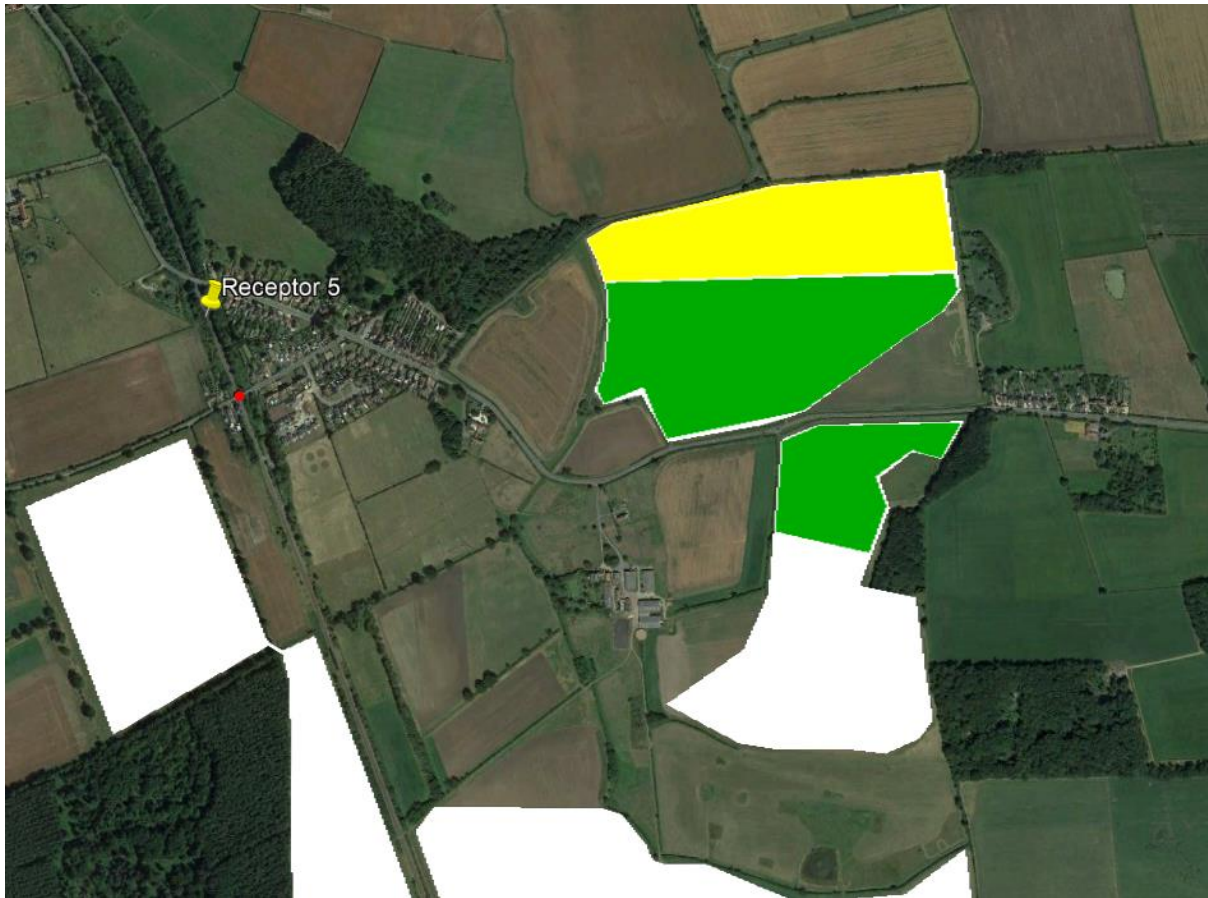
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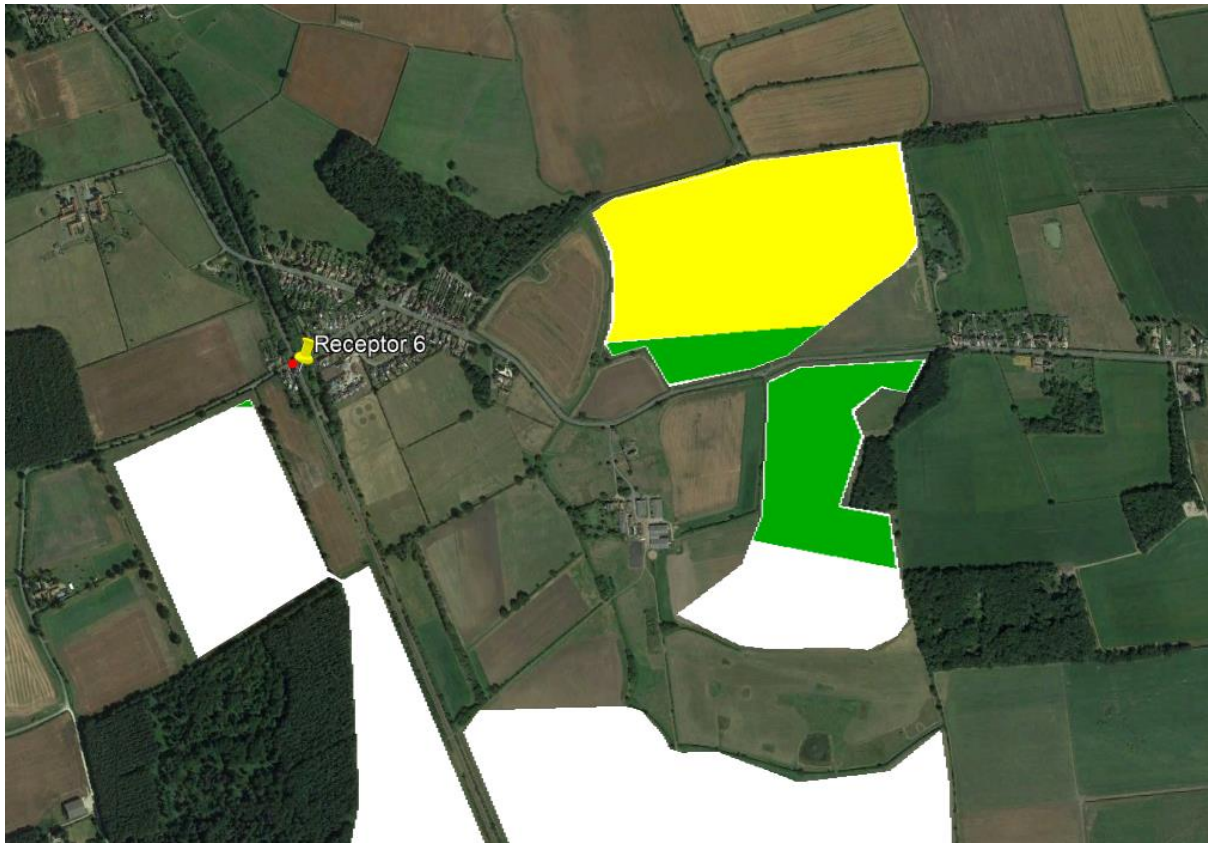
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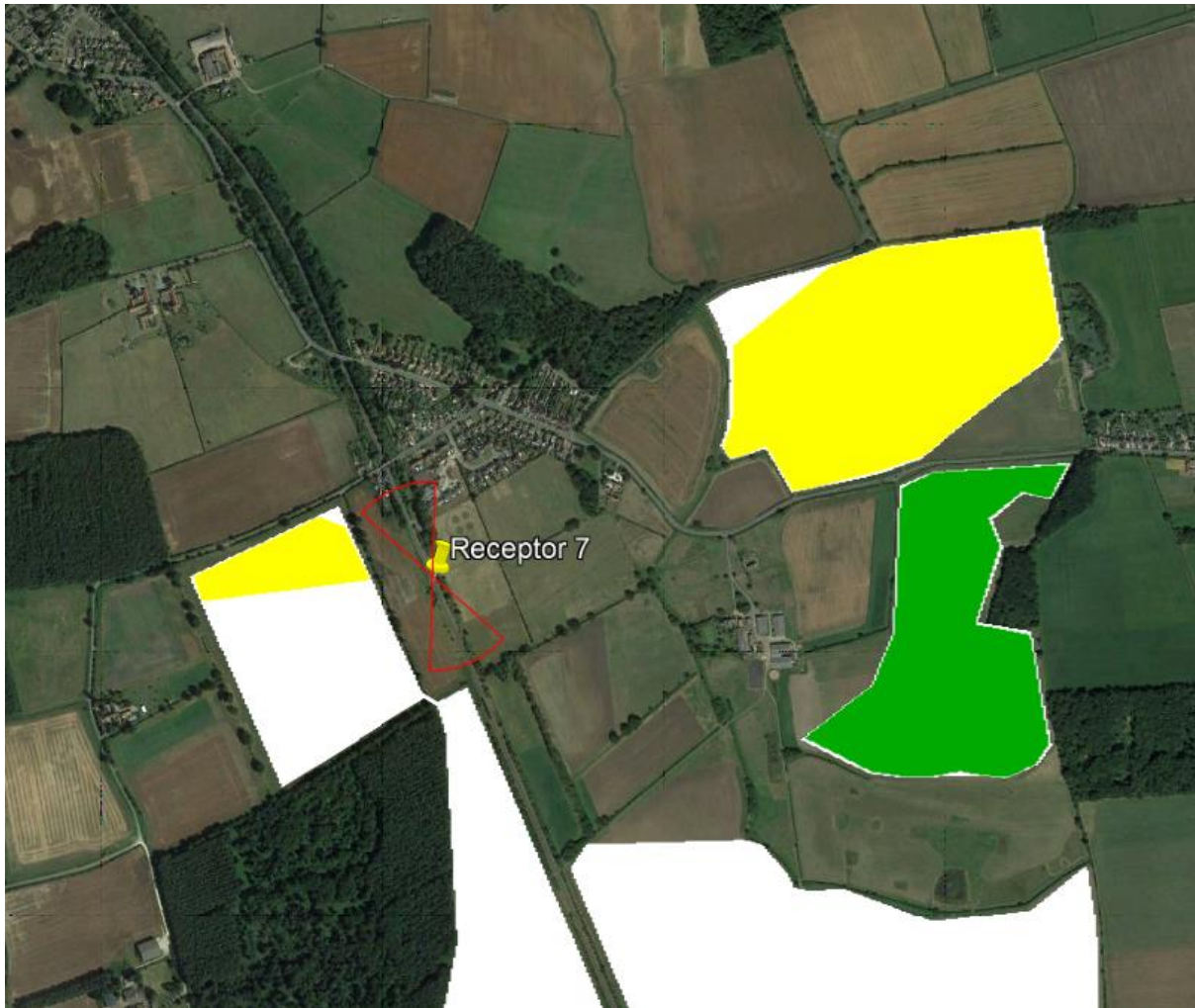
Receptor 5



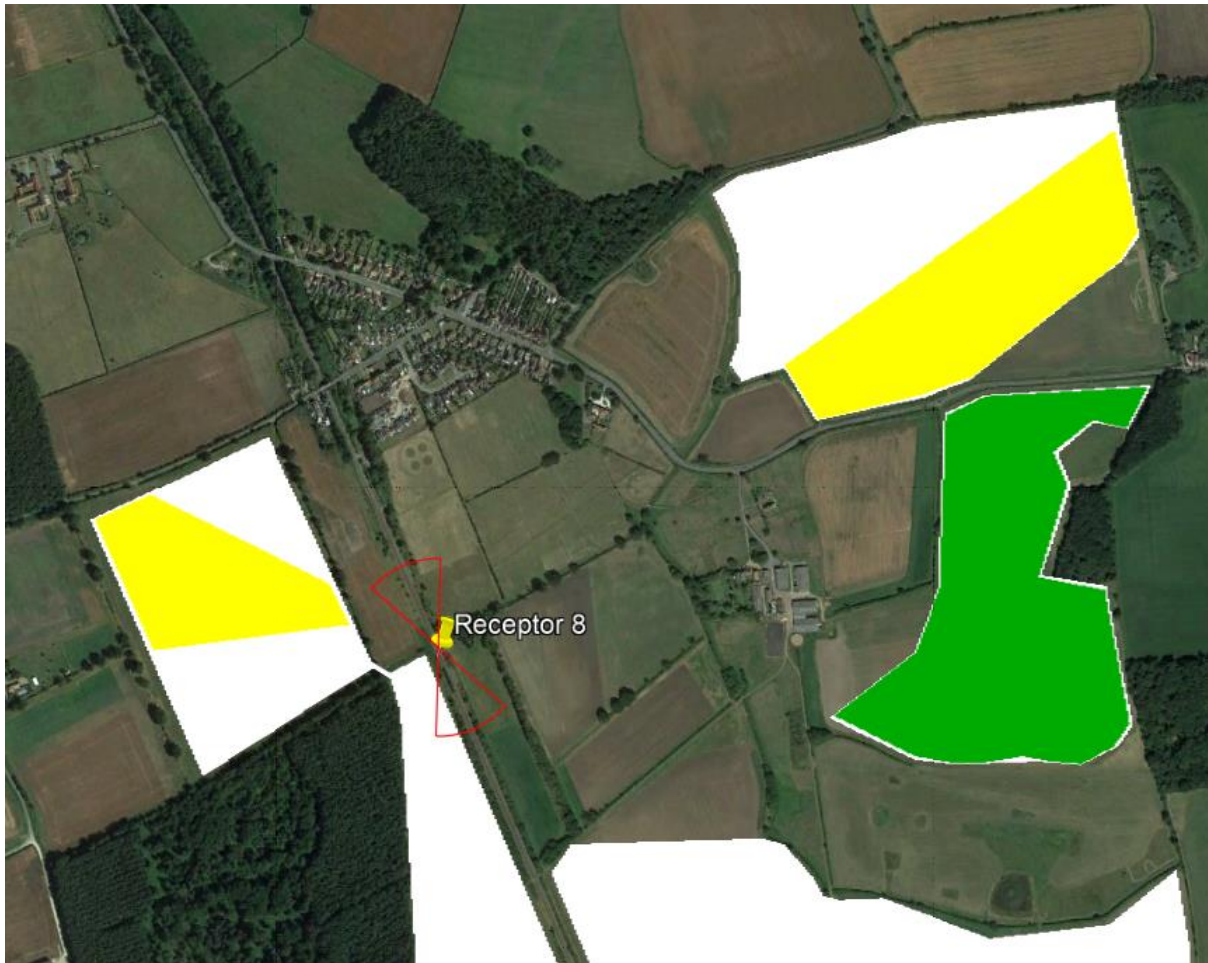
Receptor 6



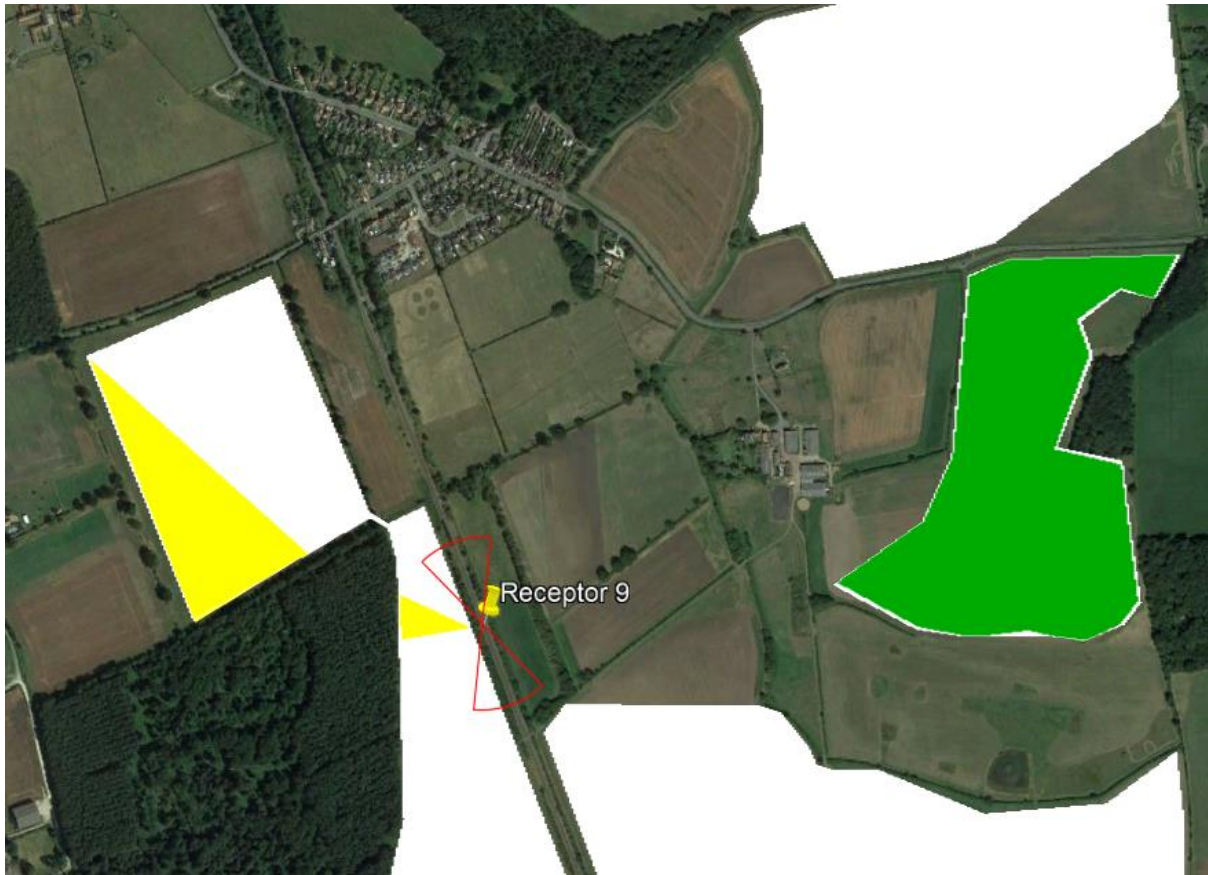
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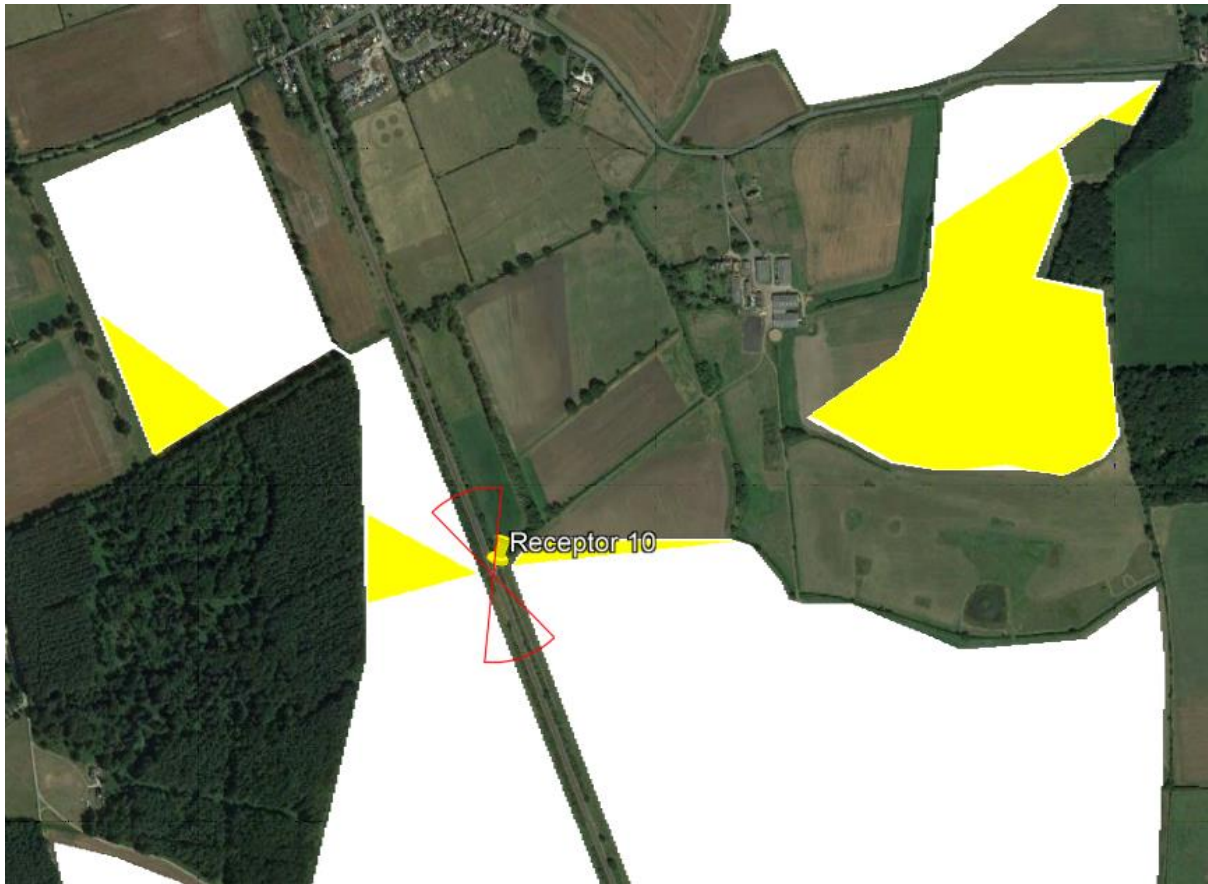
Receptor 8



Receptor 9



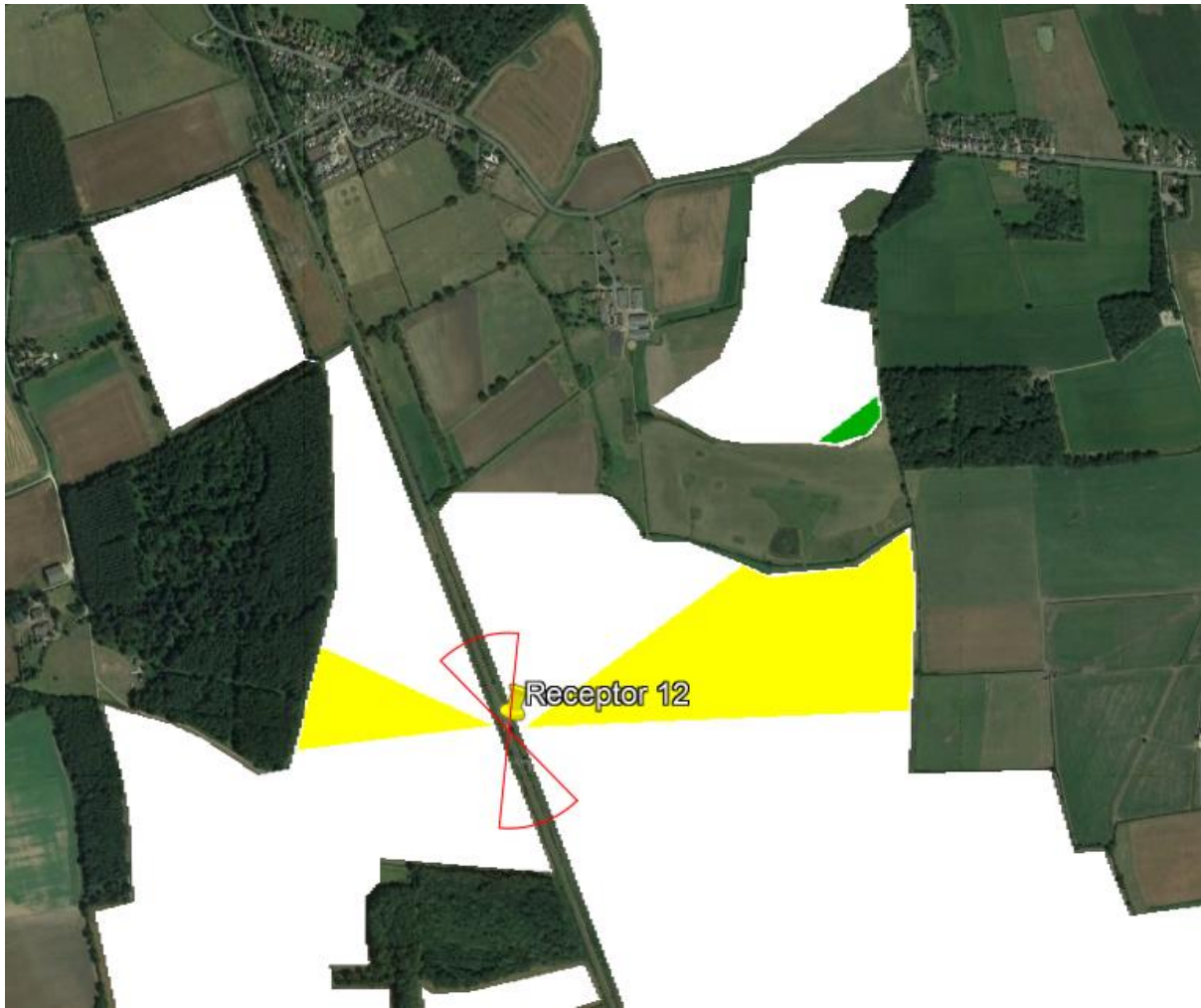
Receptor 10



Receptor 11



Receptor 12



Receptor 13



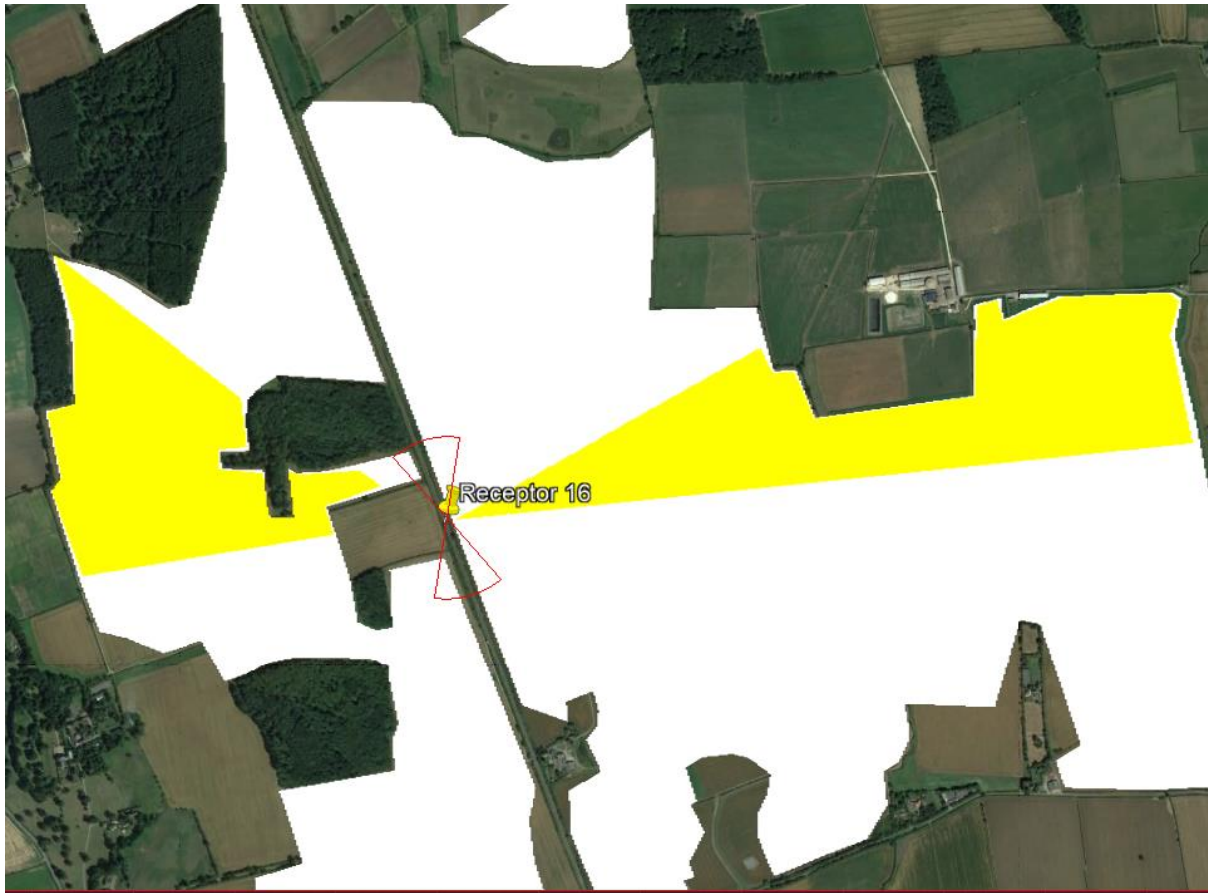
Receptor 14



Receptor 15



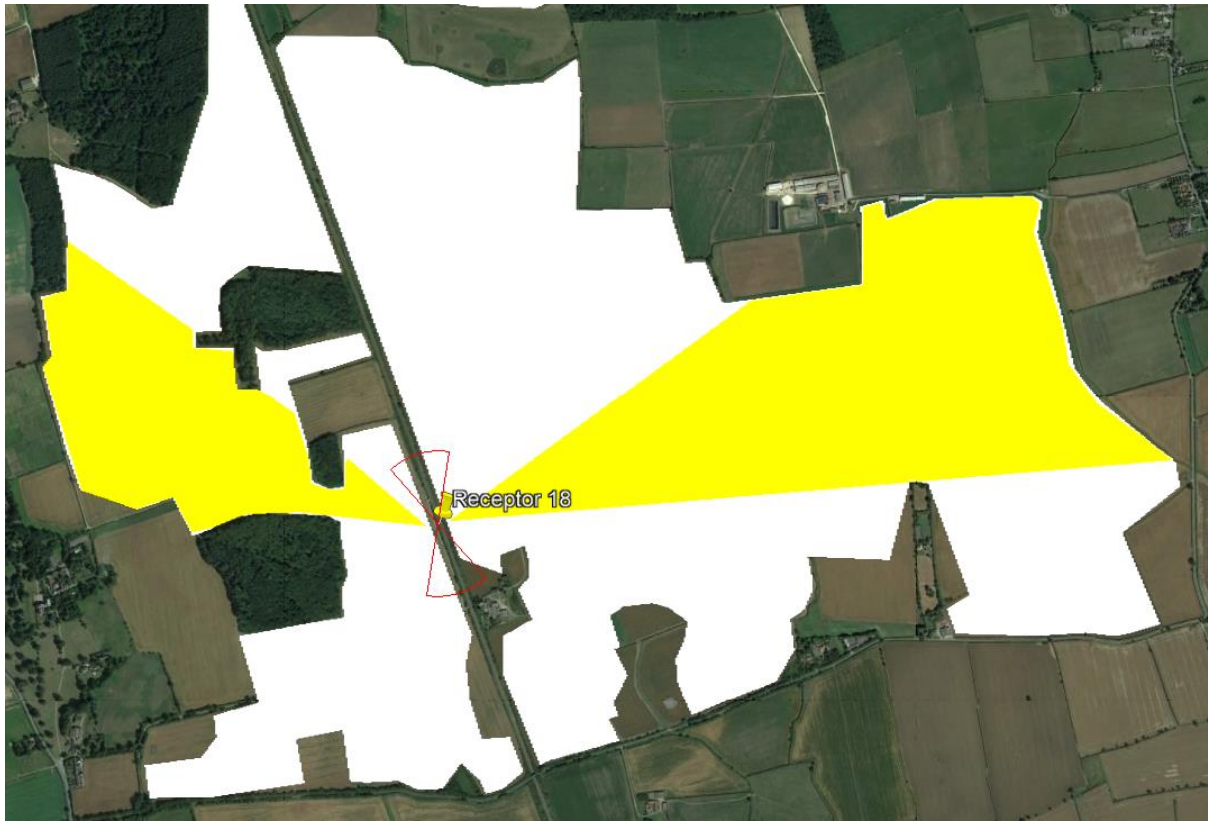
Receptor 16



Receptor 17



Receptor 18



Receptor 19



Receptor 20



Receptor 21



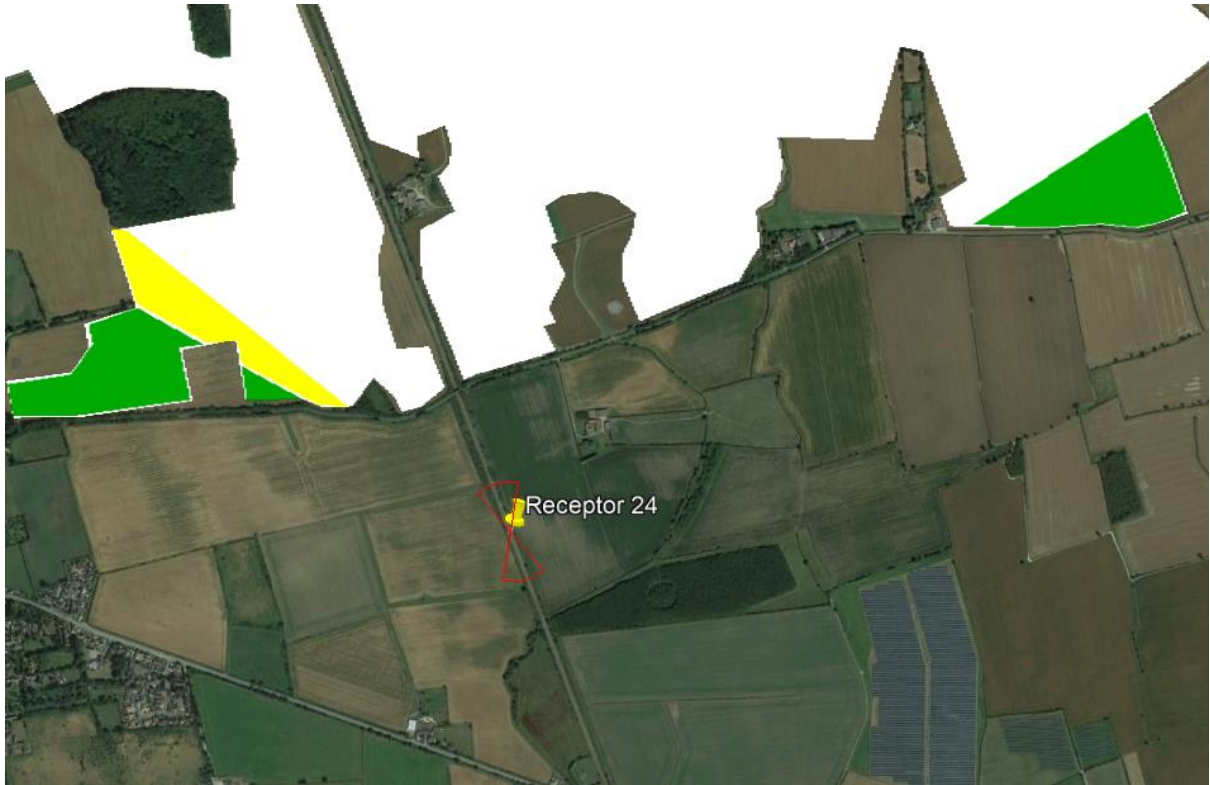
Receptor 22



Receptor 23



Receptor 24



ANNEX O: GROUND ELEVATION PROFILE

Annex O: Ground Elevation Profile

ELEVATION PROFILE BETWEEN PROPOSED DEVELOPMENT AND GAMSTON AIRFIELD ATCT

High Point



Gamston Airfield ATCT

Proposed Development

ANNEX P: SOLAR MODULE GLARE AND REFLECTANCE TECHNICAL MEMO

Solar Module Glare and Reflectance Technical Memo



Technical Notification

TITLE: SunPower Solar Module Glare and Reflectance**AUTHORS:** Technical Support**APPLICATION:** Residential/ Commercial**SCOPE:** SunPower Modules**SUMMARY:**

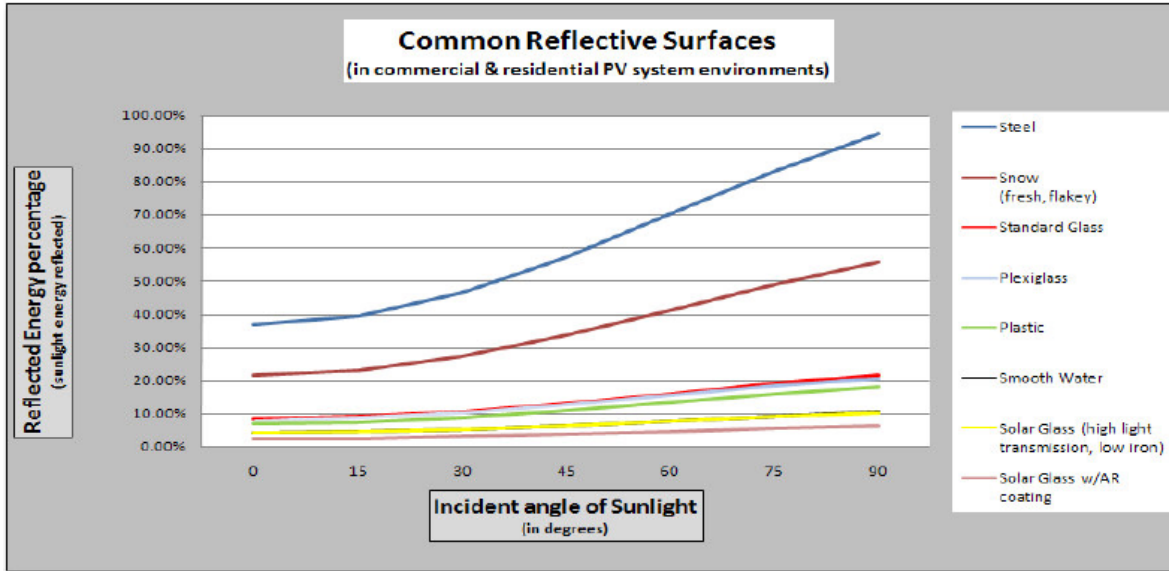
The objective of this document is to increase awareness concerning the possible glare and reflectance impact of PV Systems on their surrounding environment.

The glare and reflectance levels from a given PV system are decisively lower than the glare and reflectance generated by the standard glass and other common reflective surfaces in the environments surrounding the given PV system. Concerning random glare and reflectance observed from the air: SunPower has several large projects installed near airports or on air force bases. Each of these large projects has passed FAA or Air Force standards and all projects have been determined as "No Hazard to Air Navigation". Although the possible glare and reflectance from PV systems are at safe levels and are usually decisively lower than other standard residential and commercial reflective surfaces, SunPower suggests that customers and installers discuss any possible concerns with the neighbors/cohabitants near the planned PV system installation.

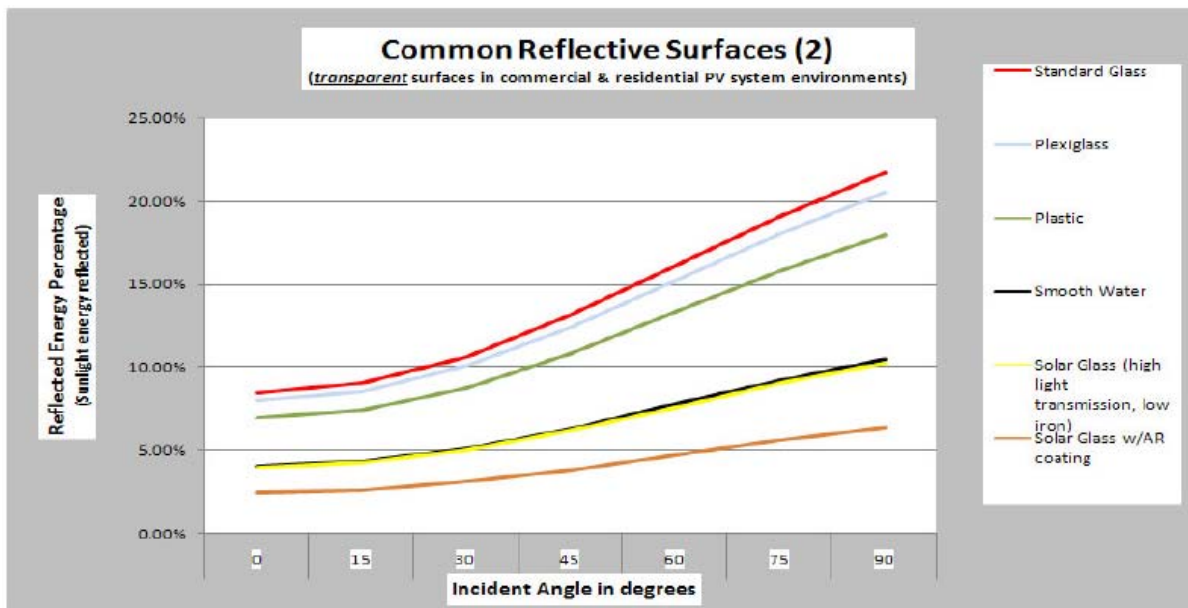
DETAILED EXPLANATION:

In general, since the whole concept of efficient solar power is to absorb as much light as possible while reflecting as little light as possible, standard solar module produces less glare and reflectance than standard window glass. This is pointed out very well in US Patent #6359212 which explains the differences in the refraction and reflection of solar module glass versus standard window glass. Solar modules use "high-transmission, low iron glass" which absorbs more light, producing small amounts of glare and reflectance than normal glass.

In the graph below, we show the reflected energy percentages of sunlight, of some common residential and commercial surfaces. The legend and the graph lists the items from top to bottom in order of the highest percentage of reflected energy.



It should be noted that the reflected energy percentage of Solar Glass is far below that of a standard glass and more on the level of smooth water. Also, below are the ratios of the common reflective surfaces:



Light beam physics resolves that the least amount of light is reflected when the beam is the normal, in other words, least light energy is reflected when the beam is at 0 degrees to the normal. The chart below is a result of light beam physics calculations:

Common Reflective Surfaces (in surrounding environments for PV systems)		Incident angle in degrees						
		0	15	30	45	60	75	90
Material Reflectivity (percent of incident light reflected)	Steel	36.73%	39.22%	46.34%	57.11%	70.02%	83.15%	94.40%
	Snow (fresh, flakey)	21.63%	23.09%	27.29%	33.63%	41.23%	48.96%	55.59%
	Standard Glass	8.44%	9.01%	10.65%	13.12%	16.09%	19.10%	21.69%
	Plexiglass	8.00%	8.54%	10.09%	12.44%	15.25%	18.11%	20.56%
	Plastic	6.99%	7.46%	8.82%	10.87%	13.33%	15.83%	17.97%
	Smooth Water	4.07%	4.35%	5.14%	6.33%	7.76%	9.22%	10.47%
	Solar Glass (high light transmission, low iron)	3.99%	4.26%	5.03%	6.20%	7.61%	9.03%	10.26%
	Solar Glass w/AR coating	2.47%	2.64%	3.12%	3.84%	4.71%	5.59%	6.35%

(Note: Index of refraction values may vary slightly depending on suppliers and reference documentation. The values for the above calculations are averages or single values obtained from the list of references for this document).

Important reference – “Stipples glass”: In addition to the superior refractive/reflective properties of solar glass versus standard glass, SunPower uses stippled solar glass for our modules. Stippled glass is used with high powered telescopes and powerful beacons and lights. The basic concept behind stippling is for the surfaces of the glass to be textured with small types of indentations. As a result, stippling allows more light energy to be channeled/ transmitted through the glass while diffusing the reflected light energy. This concept is why the reflection of off a SunPower solar module will look hazy and less-defined than the reflection from standard glass, this occurs because the stippled SunPower glass is transmitting a larger percentage of light to the solar cell while breaking up the intensity of the reflected light energy.

SUMMARY/ACTION REQUIRED:

The studies, data and light beam physics behind the charts and graphs prove beyond a reasonable doubt that solar glass has less glare and reflectance than standard glass. The figures also make it clear that the difference is very decisive between solar glass and other common residential/commercial glasses. In addition, not to be lost in the standard light/glass equations and calculations, the SunPower solar glass is stippled and has a very photon-absorbent solar cell attached to the back side, contributing two additional factors which results in even less light energy being reflected.

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