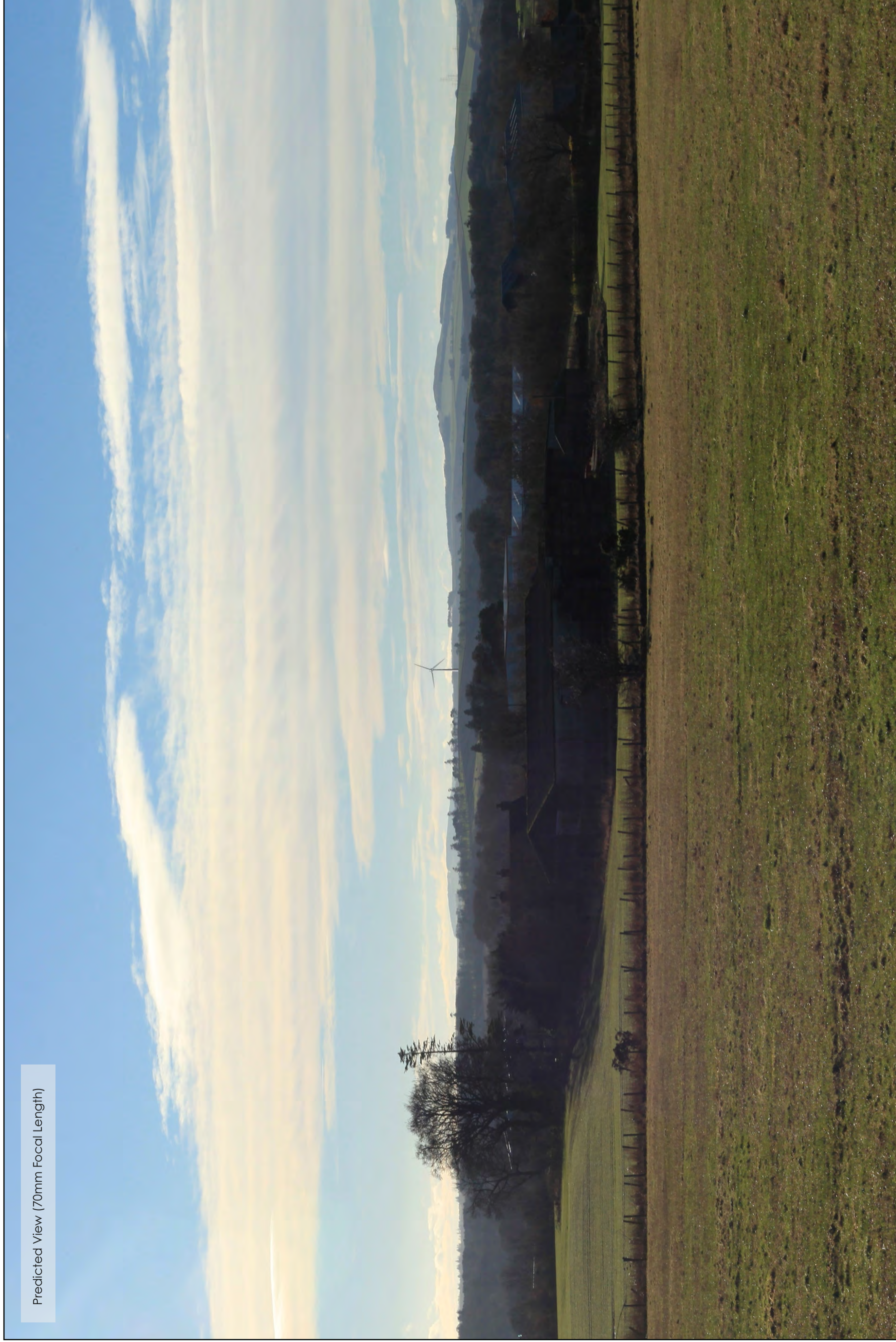


Predicted View (70mm Focal Length)



Netherton Wind Turbine



Figure 5-9a
Viewpoint 5 - A90 northbound Finavon

Viewpoint Data

Grid Reference
E349635, N757468
Elevation
56m AOD

Wireframe/Photograph

Height above ground
1.6m
Camera and Lens
Canon 5D SLR with fixed 50mm lens

Proposed Turbine Information (Netherton only)

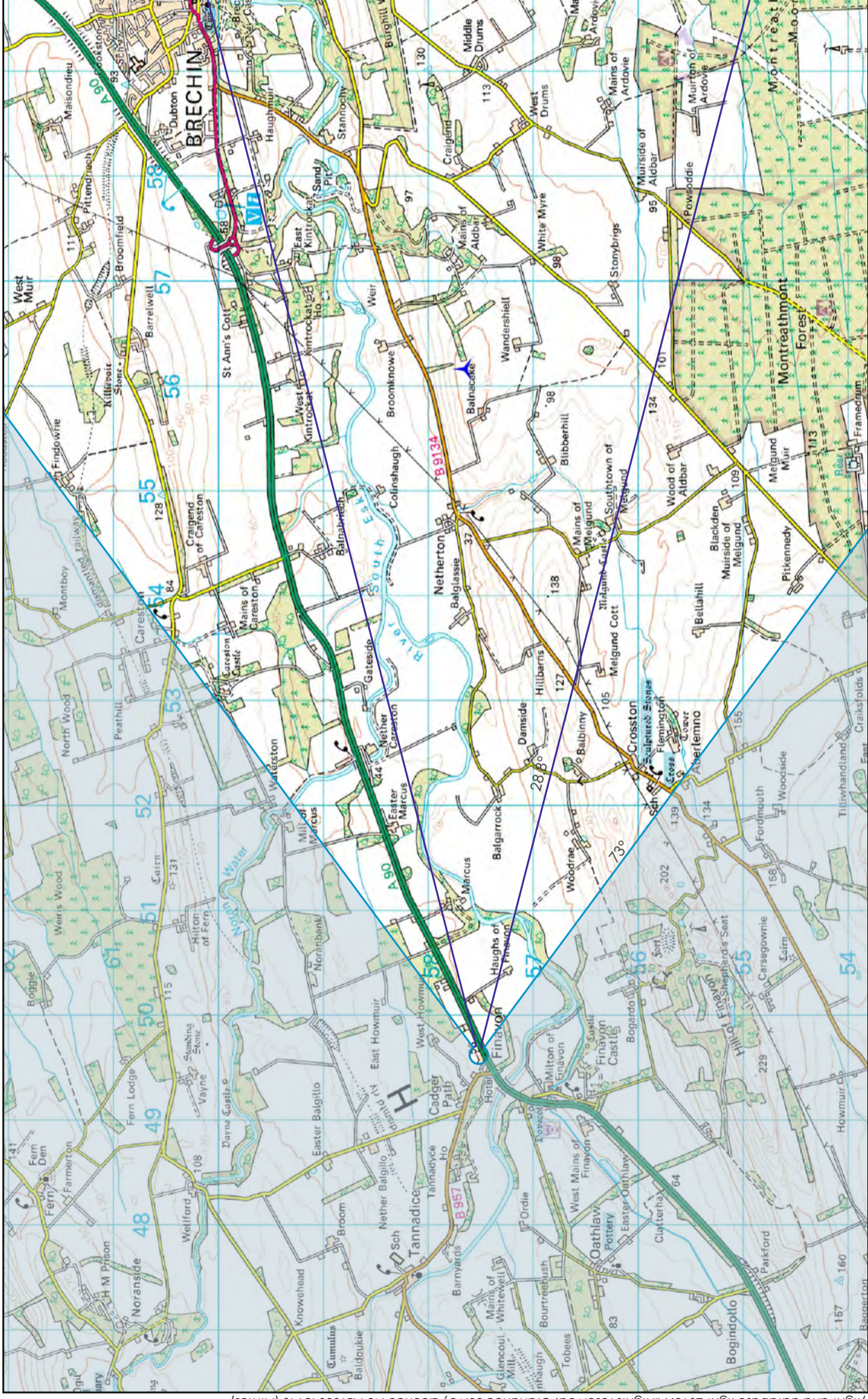
Hub Height
40m
Blade Tip Height
67m

Predicted Wireframe Turbine Visibility (Netherton only)

Number of Turbine Tips Visible*
1
Number of Turbine Hubs Visible
1
Turbine Distance
6,529m



Wide Angle Photo of Existing View Included Angle 110° Approximate Viewing Distance 210mm



The following images can only be accurately assessed from the correct Viewing Distance, where the curvature of the earth has been accounted for. Wireframes are generated using Ordnance Survey's Terrain 50 Dataset which does not take in to account the screening effects of buildings or vegetation. *Refers to the number of turbines that blade tips can be seen rather than the number of individual tips seen from the viewpoint.

Existing View

A 90
Brechin 7
Laurencekirk 17
Stonehaven 31
Aberdeen 46

P
440 yds

East Pitforthie

Netherton

60°

70°

80°

East

100°

110°

120°

atmos
CONSULTING

Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 5: A90 northbound Finavon

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

Figure 5-9b



Drawn by JM
Checked by TP
Approved by NT

T101c
10/2/2014
4611_PM_C015b

Predicted View

A 90
Brechin 7
Laurencekirk 17
Stonehaven 31
Aberdeen 46

P
440 yds

East Pitforthie

Netherton

atmos
CONSULTING

Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 5: A90 northbound Finavon

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

Figure 5-9c



Drawn by JM
Checked by TP
Approved by NT

T101c
10/2/2014
4611_PM_C015b

Predicted View (70mm Focal Length)



Netherton Wind Turbine



Figure 5-10a
Viewpoint 6 - Turin Hill

Viewpoint Data

Grid Reference E351468, N753547
Elevation 248m AOD

Wireframe/Photograph

Height above ground 1.6m
Camera and Lens Canon 5D SLR with fixed 50mm lens

Proposed Turbine Information (Netherton only)

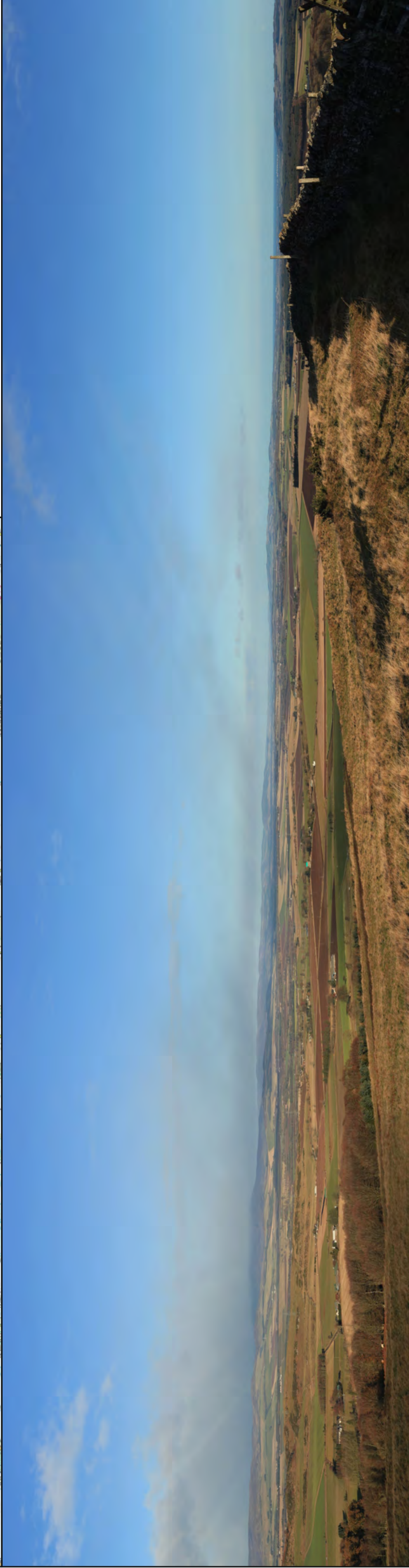
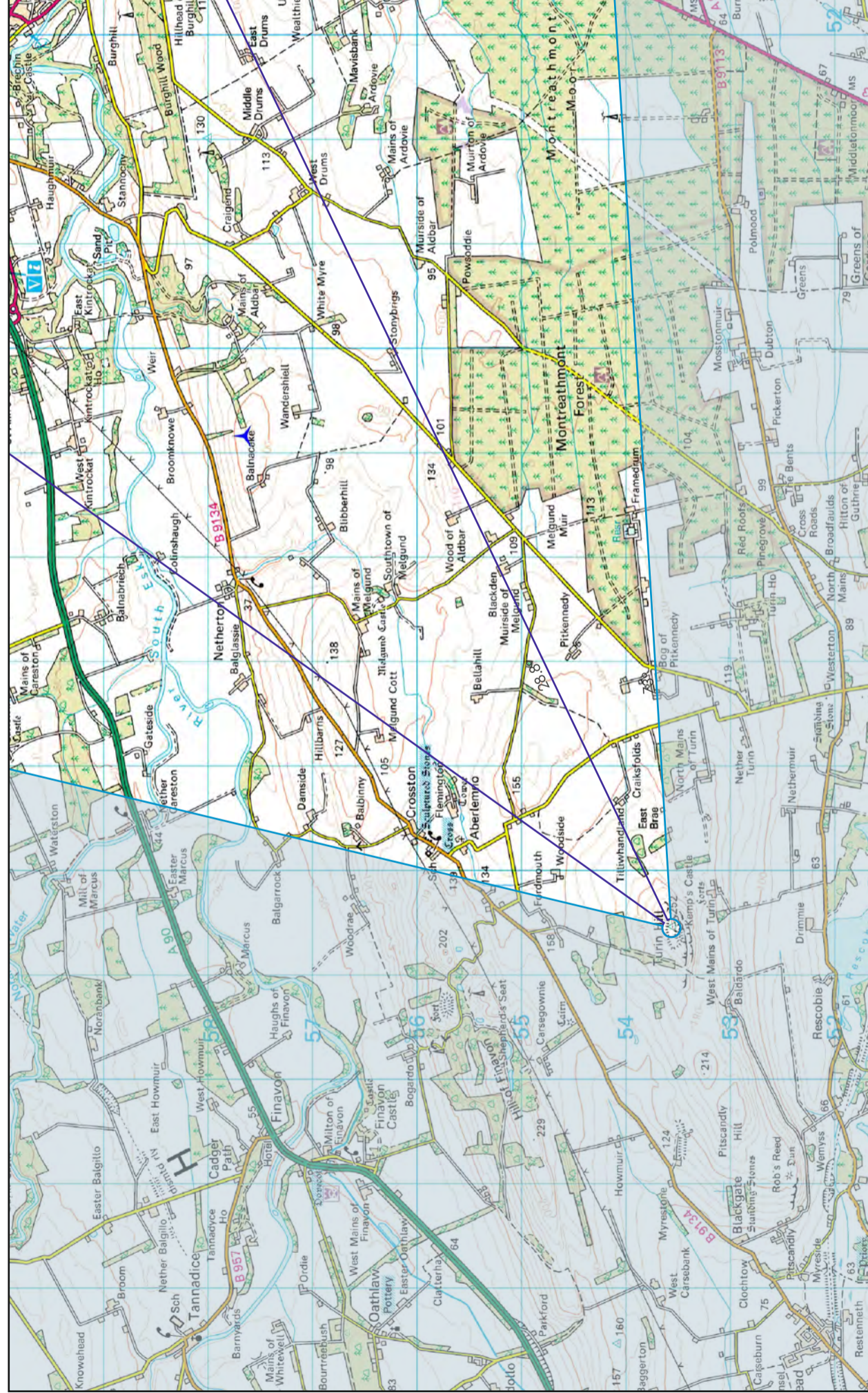
Hub Height 40m
Blade Tip Height 67m

Predicted Wireframe Turbine Visibility (Netherton only)

Number of Turbine Tips Visible* 1
Number of Turbine Hubs Visible 1
Turbine Distance 6.252m



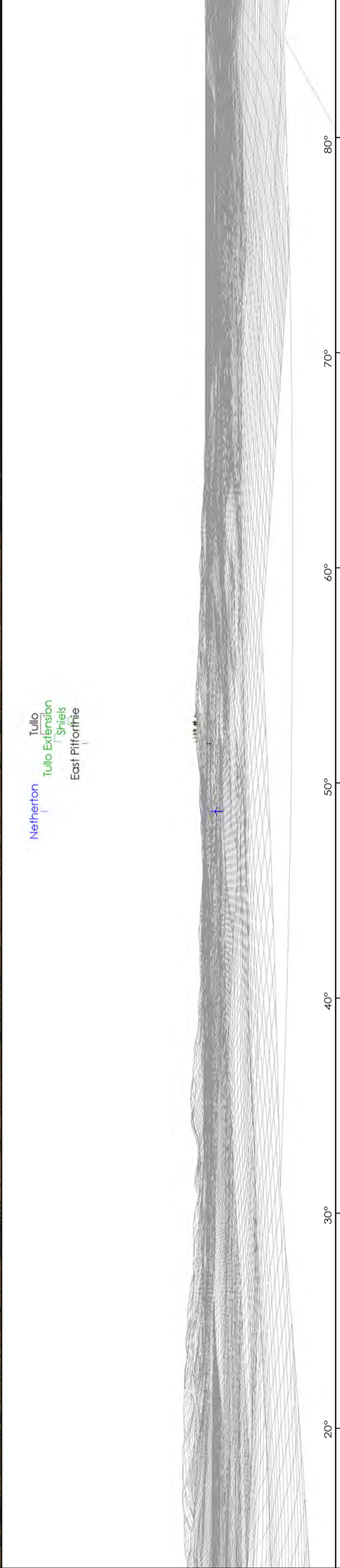
Wide Angle Photo of Existing View Included Angle 110° Approximate Viewing Distance 210mm



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*Refers to the number of turbines that blade tips can be seen rather than the number of individual tips seen from the viewpoint.

Existing View

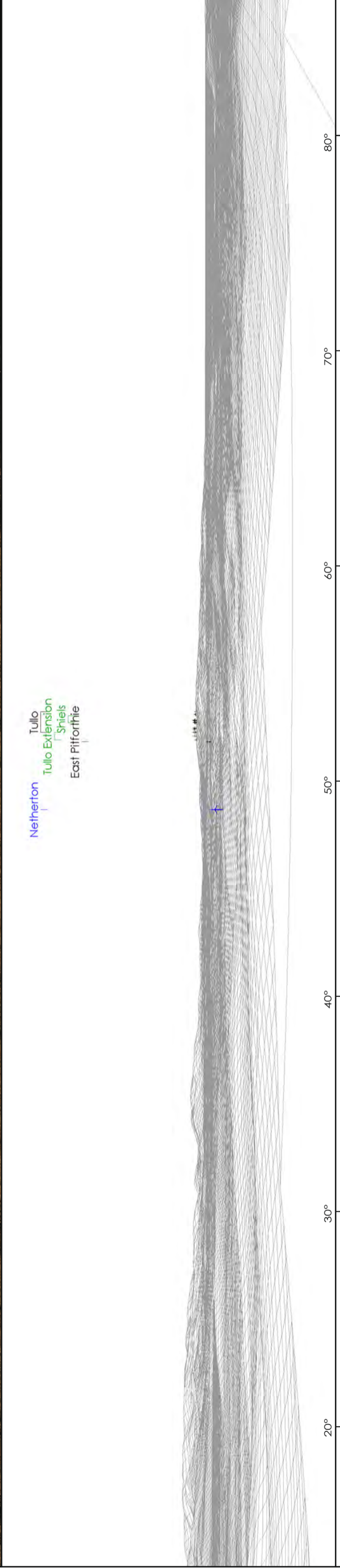


	Polar Energy (Netherthon) Ltd	Netherthon Wind Turbine	Viewpoint 6: Turin Hill	Horizontal View Angle 73° Approximate Viewing Distance 315mm	Figure 5-10b	 	Drawn by JM Checked by TP Approved by NT	T101c 10/2/2014 4611_PM_C016b
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Predicted View



Netherton
Tullo
Tullo Extension
Shiels
East Pitforrie



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CONSULTING

Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 6: Turin Hill

Horizontal View Angle 73°
Approximate Viewing Distance 31.5mm

Figure 5-10c



Drawn by JM
Checked by TP
Approved by NT

T101c
10/2/2014
4611_PM_C016b

Predicted View (70mm Focal Length)



Netherton Wind Turbine

Polar Energy (Netherton) Ltd



**Figure 5-11a
Viewpoint 7 - White Caterthun**

Viewpoint Data

Grid Reference E354691, N765981
Elevation 290m AOD

Wireframe/Photograph

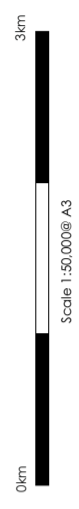
Height above ground 1.6m
Camera and Lens Canon 5D SLR with fixed 50mm lens

Proposed Turbine Information (Netherton only)

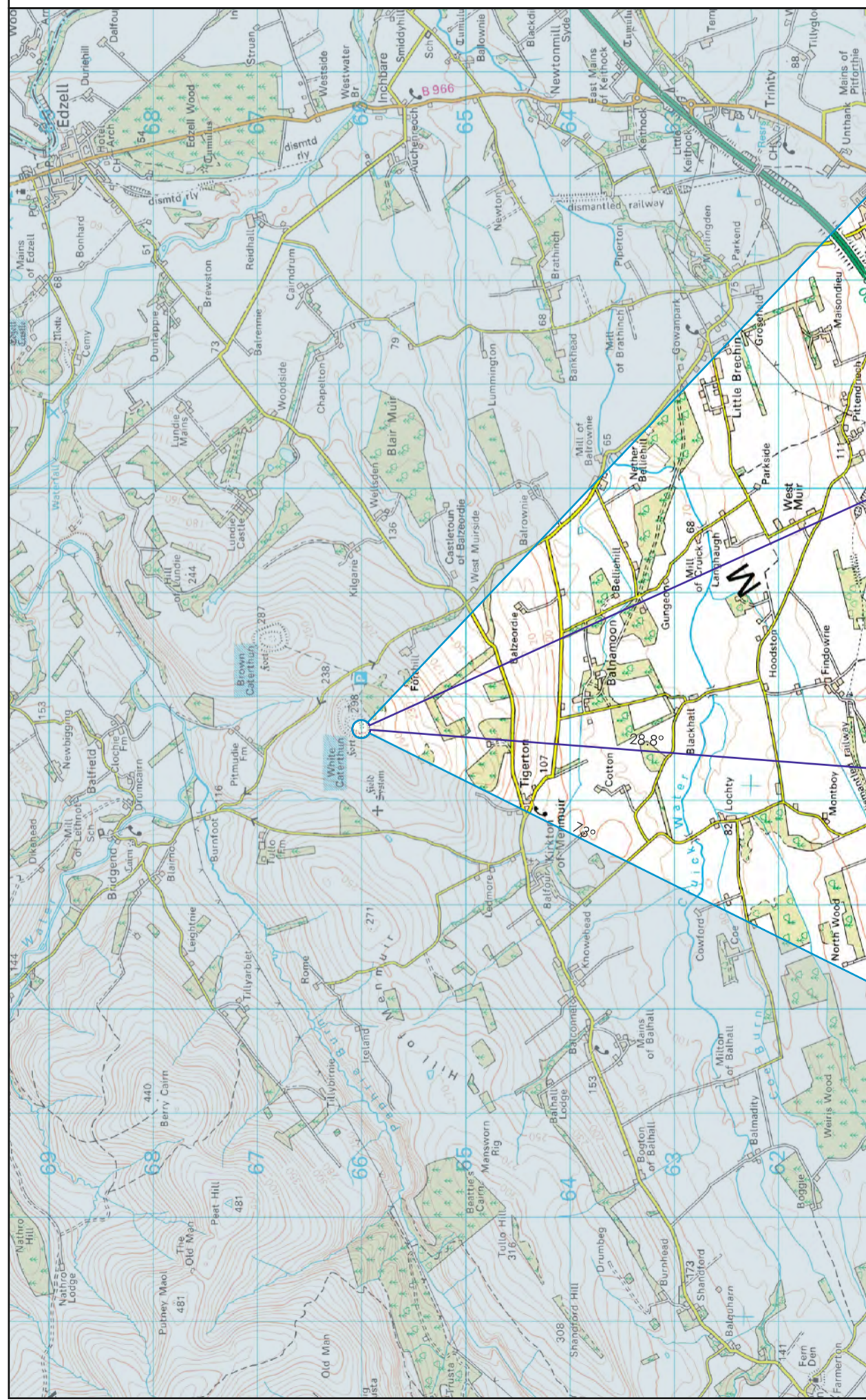
Hub Height 40m
Blade Tip Height 67m

Predicted Wireframe Turbine Visibility (Netherton only)

Number of Turbine Tips Visible* 1
Number of Turbine Hubs Visible 1
Turbine Distance 8.432m



Wide Angle Photo of Existing View Included Angle 110° Approximate Viewing Distance 210mm



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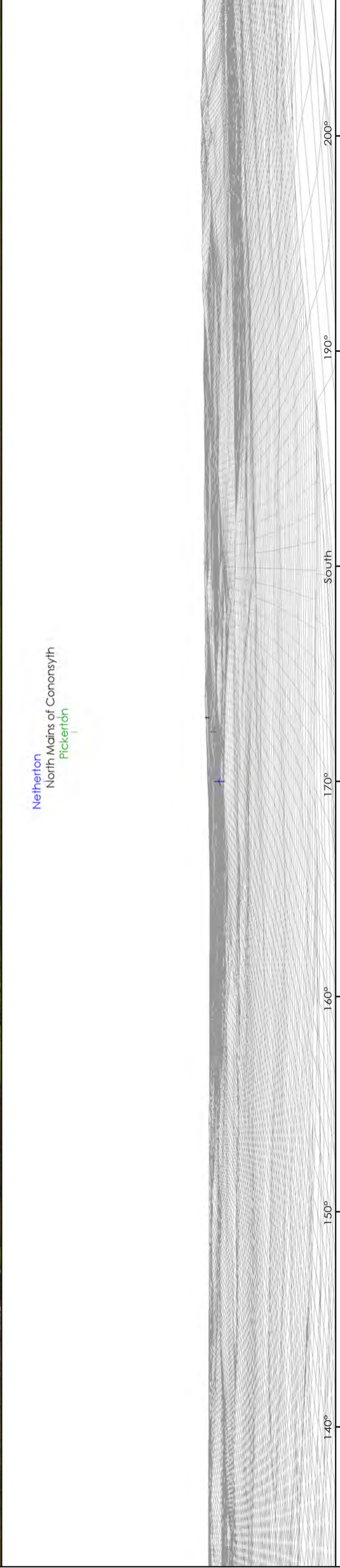
The following images can only be accurately assessed from the correct Viewing Distance, where the curvature of the earth has been accounted for. Wireframes are generated using Ordnance Survey's Terrain 50 Dataset which does not take in to account the screening effects of buildings or vegetation. *Refers to the number of turbines that blade tips can be seen rather than the number of individual tips seen from the viewpoint.



Existing View



Netherton
North Mains of Cononsyth
Pickertón



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Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 7: White Caterthun

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

Figure 5-11b



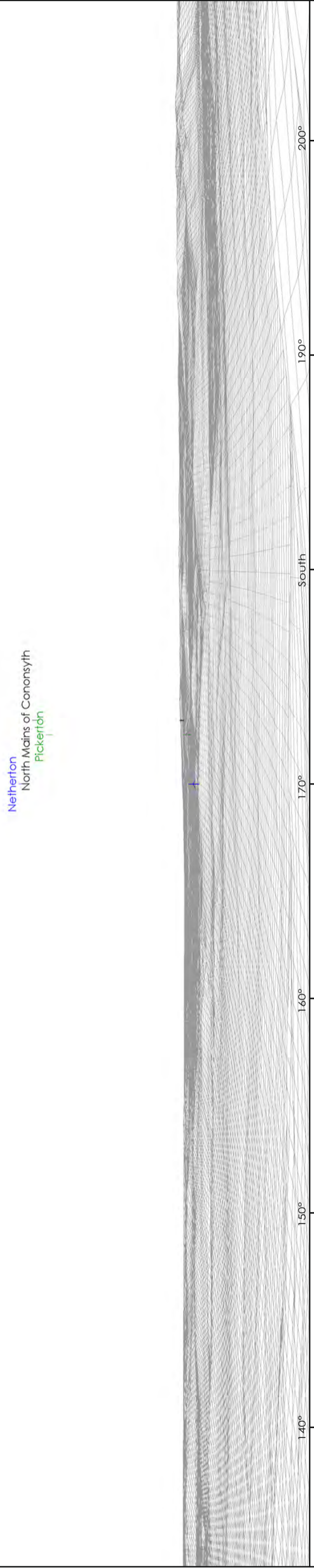
Drawn by JM
Checked by TP
Approved by NT

T101c
10/2/2014
4611_PM_C017b

Predicted View



Netherton
North Mains of Cononsyth
Pickertón



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Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 7: White Caterthun

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

Figure 5-11c



Drawn by JM
Checked by TP
Approved by NT

T101c
10/2/2014
4611_PM_C017b

Predicted View (70mm Focal Length)



Netherton Wind Turbine



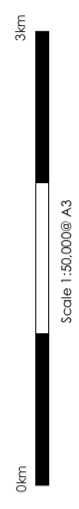
Figure 5-12a
Viewpoint 8 - Minor Road, Fithie / Rossie Moor

Viewpoint Data
 Grid Reference
 E363255, N754698
 Elevation
 52m AOD

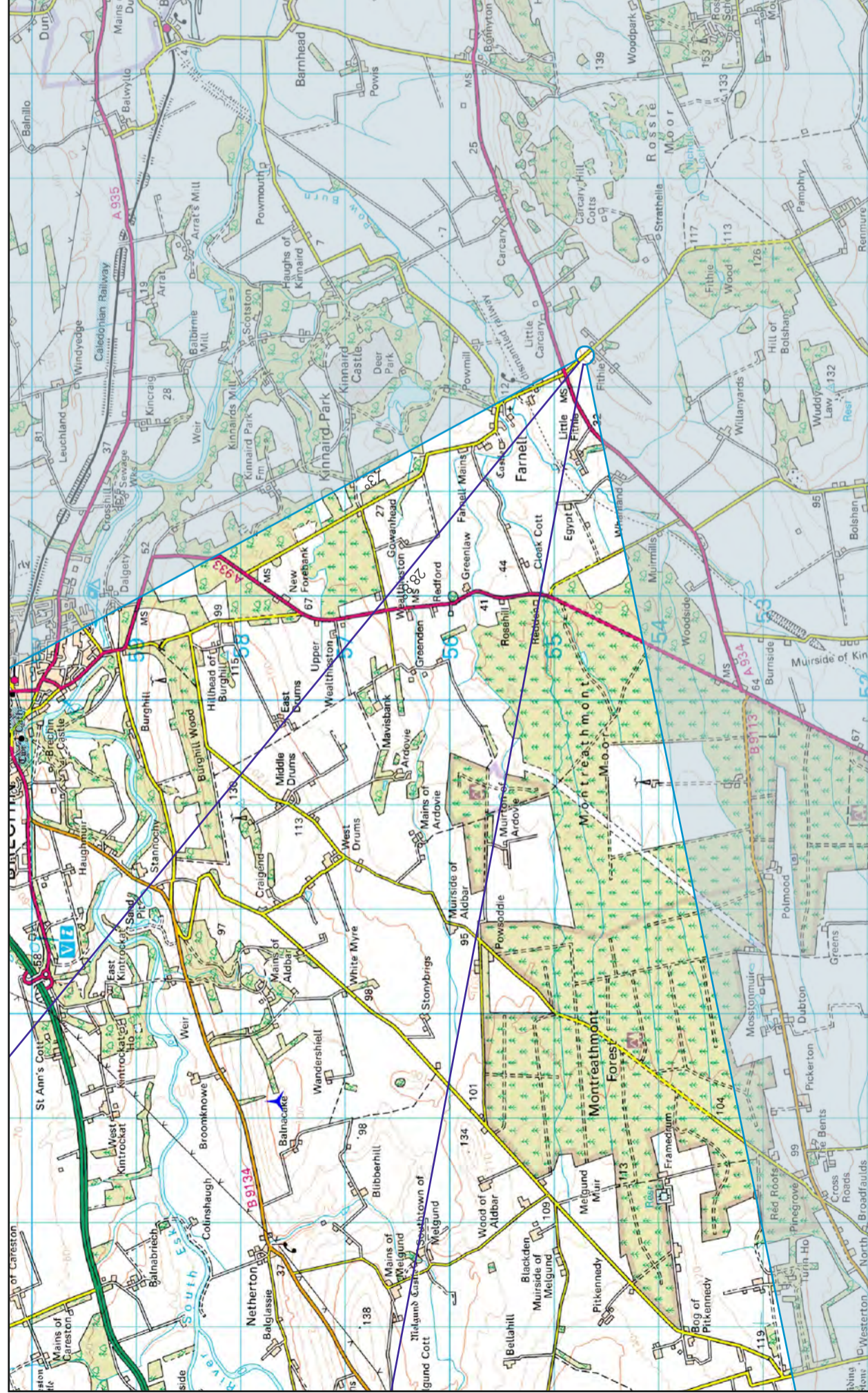
Wireframe/Photograph
 Height above ground
 1.6m
 Camera and Lens
 Canon 5D SLR with fixed 50mm lens

Proposed Turbine Information (Netherton only)
 Hub Height
 40m
 Blade Tip Height
 67m

Predicted Wireframe Turbine Visibility (Netherton only)
 Number of Turbine Tips Visible*
 1
 Number of Turbine Hubs Visible
 1
 Turbine Distance
 7,694m

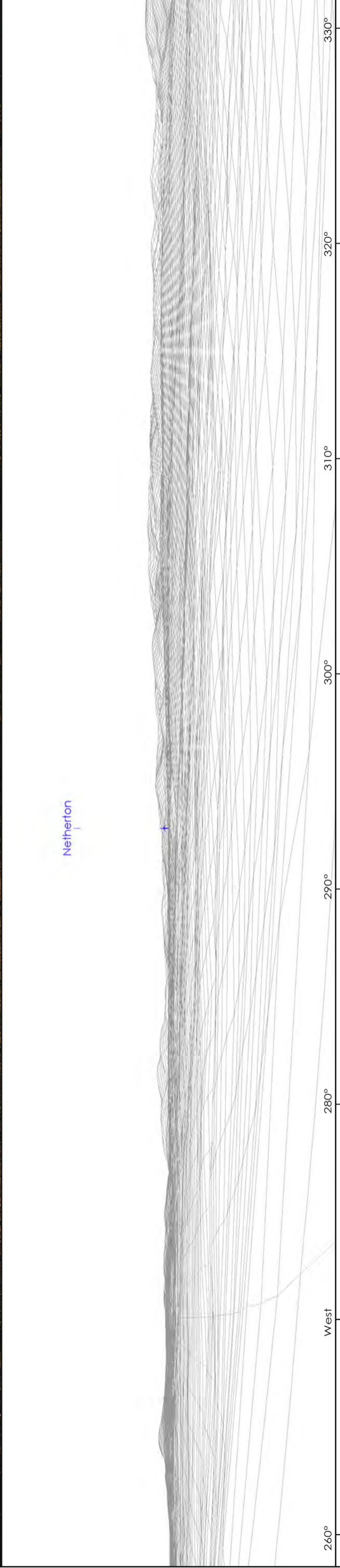


Wide Angle Photo of Existing View Included Angle 110° Approximate Viewing Distance 210mm



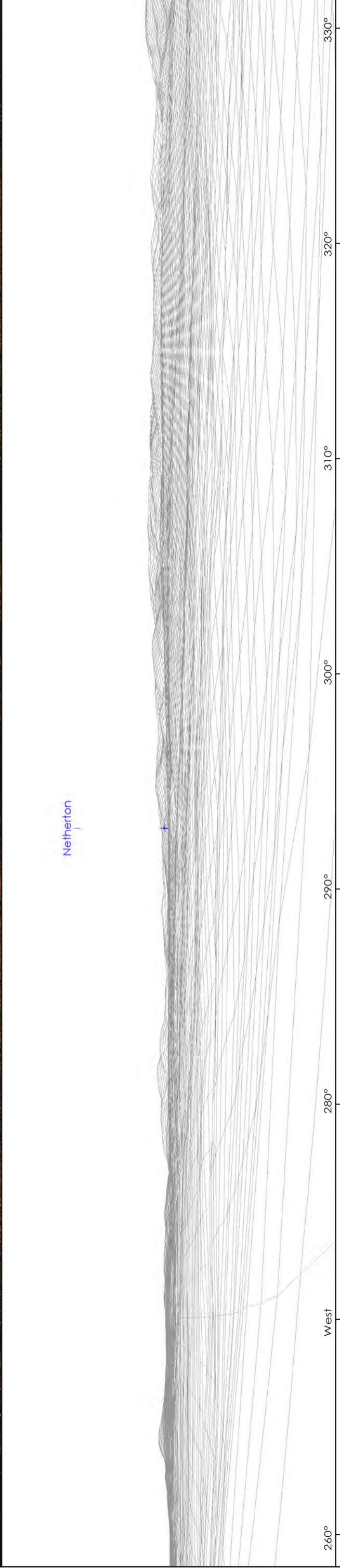
The following images can only be accurately assessed from the correct Viewing Distance, where the curvature of the earth has been accounted for. Wireframes are generated using Ordnance Survey's Terrain 50 Dataset which does not take in to account the screening effects of buildings or vegetation. *Refers to the number of turbines that blade tips can be seen rather than the number of individual tips seen from the viewpoint.

Existing View



	Polar Energy (Netherpton) Ltd	Netherpton Wind Turbine	Viewpoint 8: Minor Road, Fithie / Rossie Moor	Horizontal View Angle 73° Approximate Viewing Distance 315mm	Figure 5-12b		Drawn by JM Checked by TP Approved by NT 1101c 10/2/2014 4611_PM_C018b
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Existing View



260°

West

280°

290°

300°

310°

320°

330°

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Polar Energy
(Netherpton) Ltd

Netherpton Wind Turbine

Viewpoint 8: Minor Road,
Fithie / Rossie Moor

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

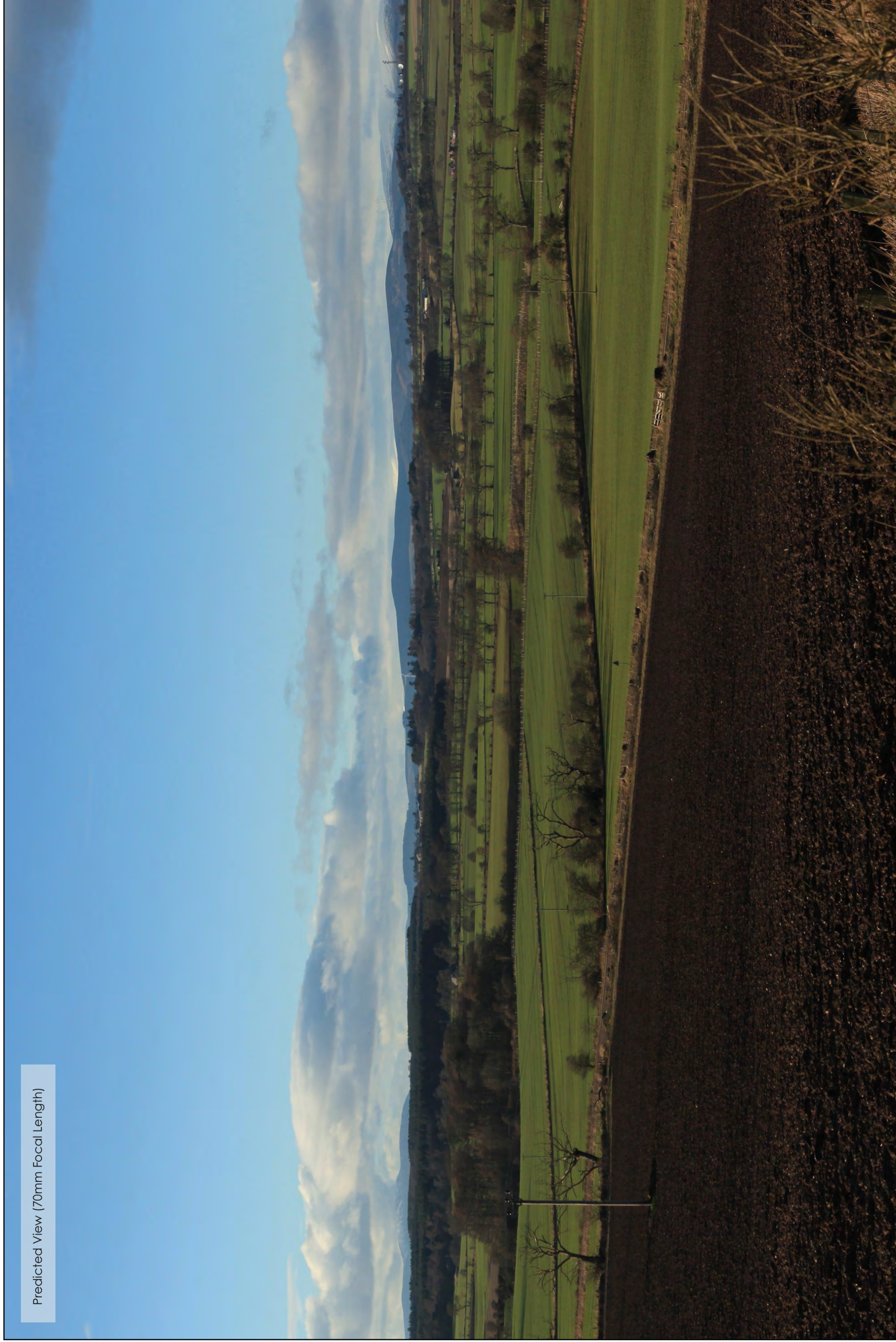
Figure 5-12c



Drawn by JM
Checked by TP
Approved by NT

T101c
10/2/2014
4611_PM_C018b

Predicted View (70mm Focal Length)



Netherton Wind Turbine



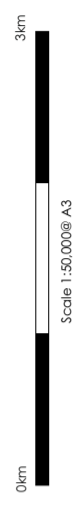
Figure 5-13a
Viewpoint 9 - B9134 near Netherton

Viewpoint Data
Grid Reference
E355145, N757776
Elevation
54m AOD

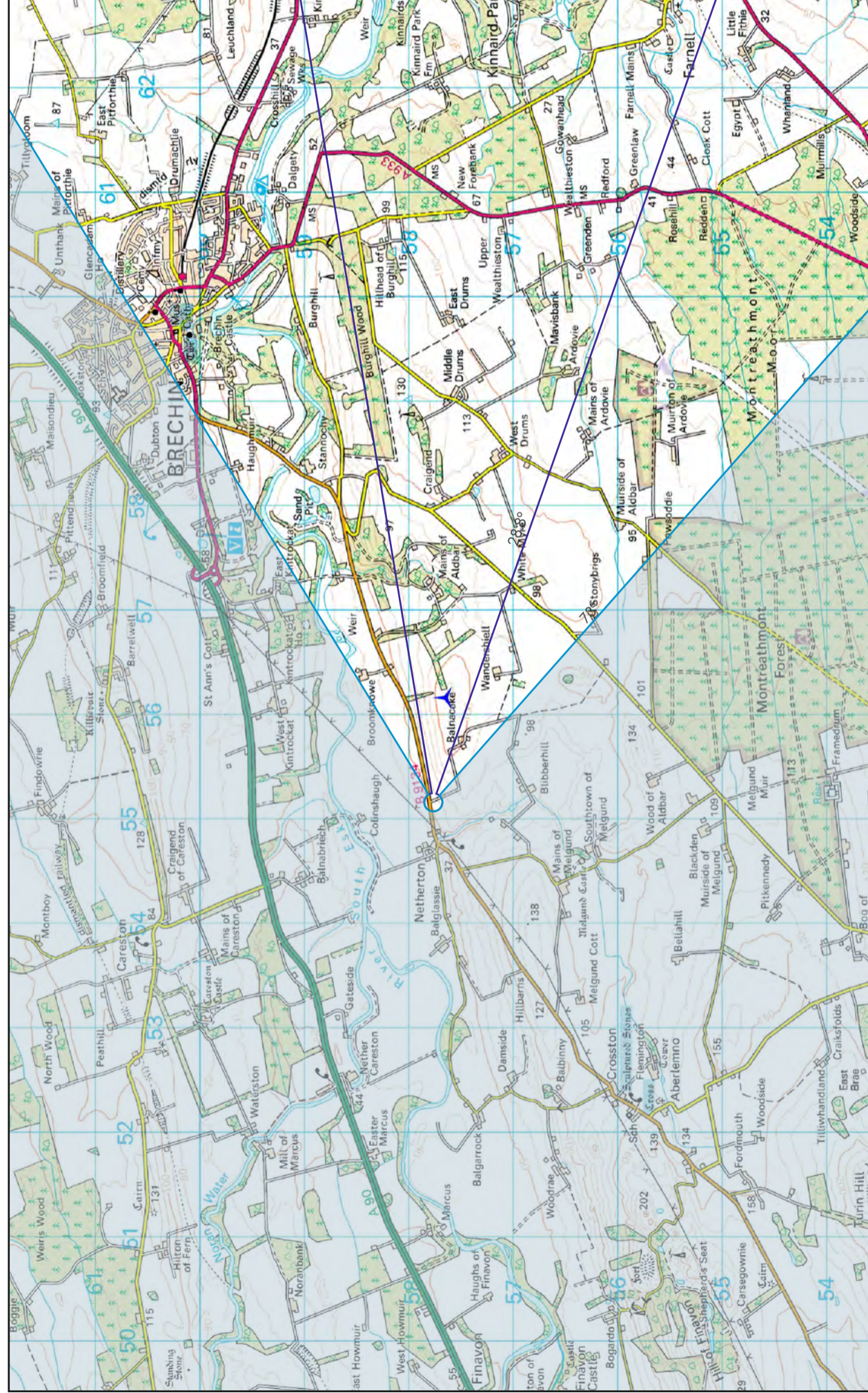
Wireframe/Photograph
Height above ground
1.6m
Camera and Lens
Canon 5D SLR with fixed 50mm lens

Proposed Turbine Information (Netherton only)
Hub Height
40m
Blade Tip Height
67m

Predicted Wireframe Turbine Visibility (Netherton only)
Number of Turbine Tips Visible*
1
Number of Turbine Hubs Visible
1
Turbine Distance
1,020m



Wide Angle Photo of Existing View Included Angle 110° Approximate Viewing Distance 210mm



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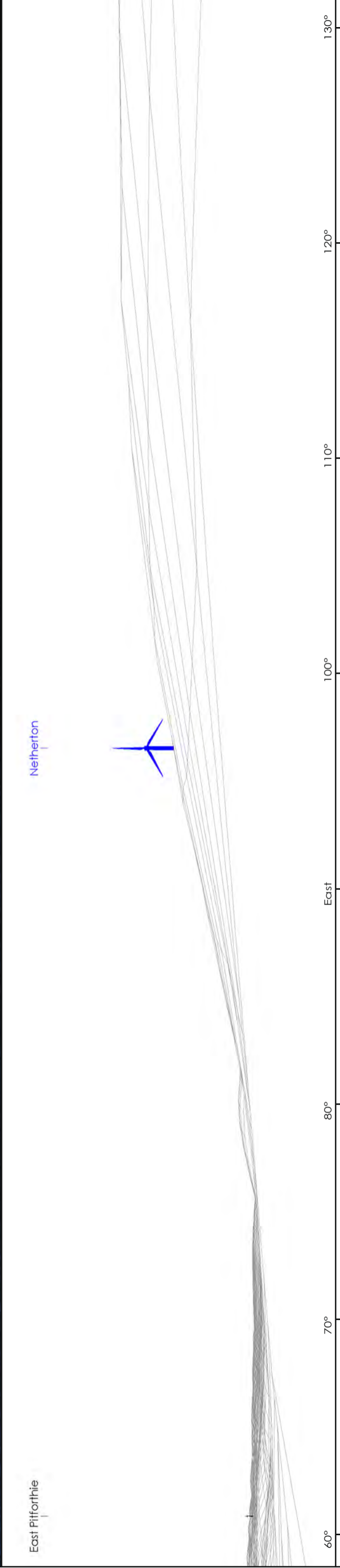
The following images can only be accurately assessed from the correct Viewing Distance, where the curvature of the earth has been accounted for.
Wireframes are generated using Ordnance Survey's Terrain 50 Dataset which does not take in to account the screening effects of buildings or vegetation.
*Refers to the number of turbines that blade tips can be seen rather than the number of individual tips seen from the viewpoint.

Existing View



East Pilforthie

Netherton



60°

70°

80°

East

100°

110°

120°

130°

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CONSULTING

Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 9: B9134 near Netherton

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

Figure 5-13b



Drawn by JM
Checked by TP
Approved by NT

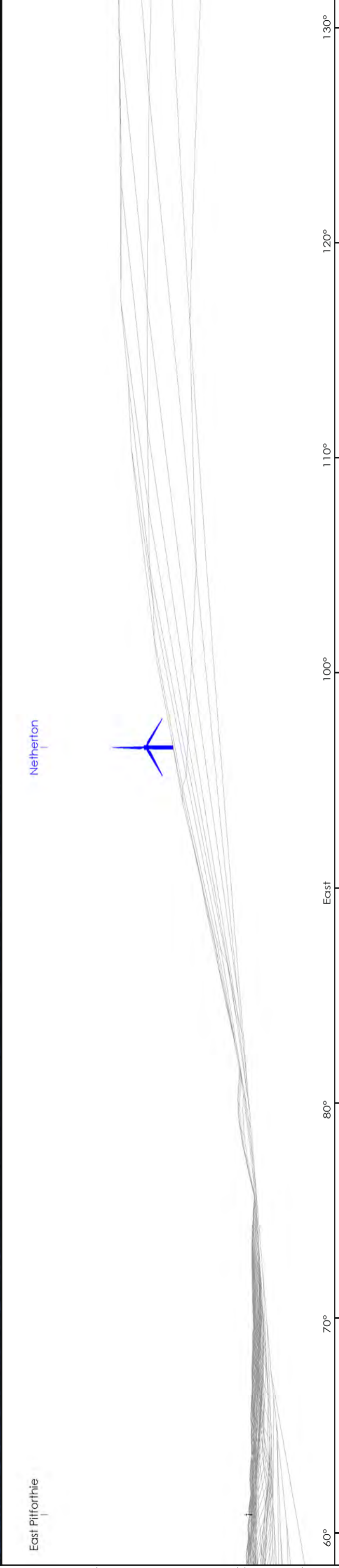
T101c
10/2/2014
4611_PM_C019b

Predicted View



East Pifforthis

Netherton



60°

70°

80°

East

100°

110°

120°

130°

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Polar Energy
(Netherton) Ltd

Netherton Wind Turbine

Viewpoint 9: B9134 near Netherton

Horizontal View Angle 73°
Approximate Viewing Distance 315mm

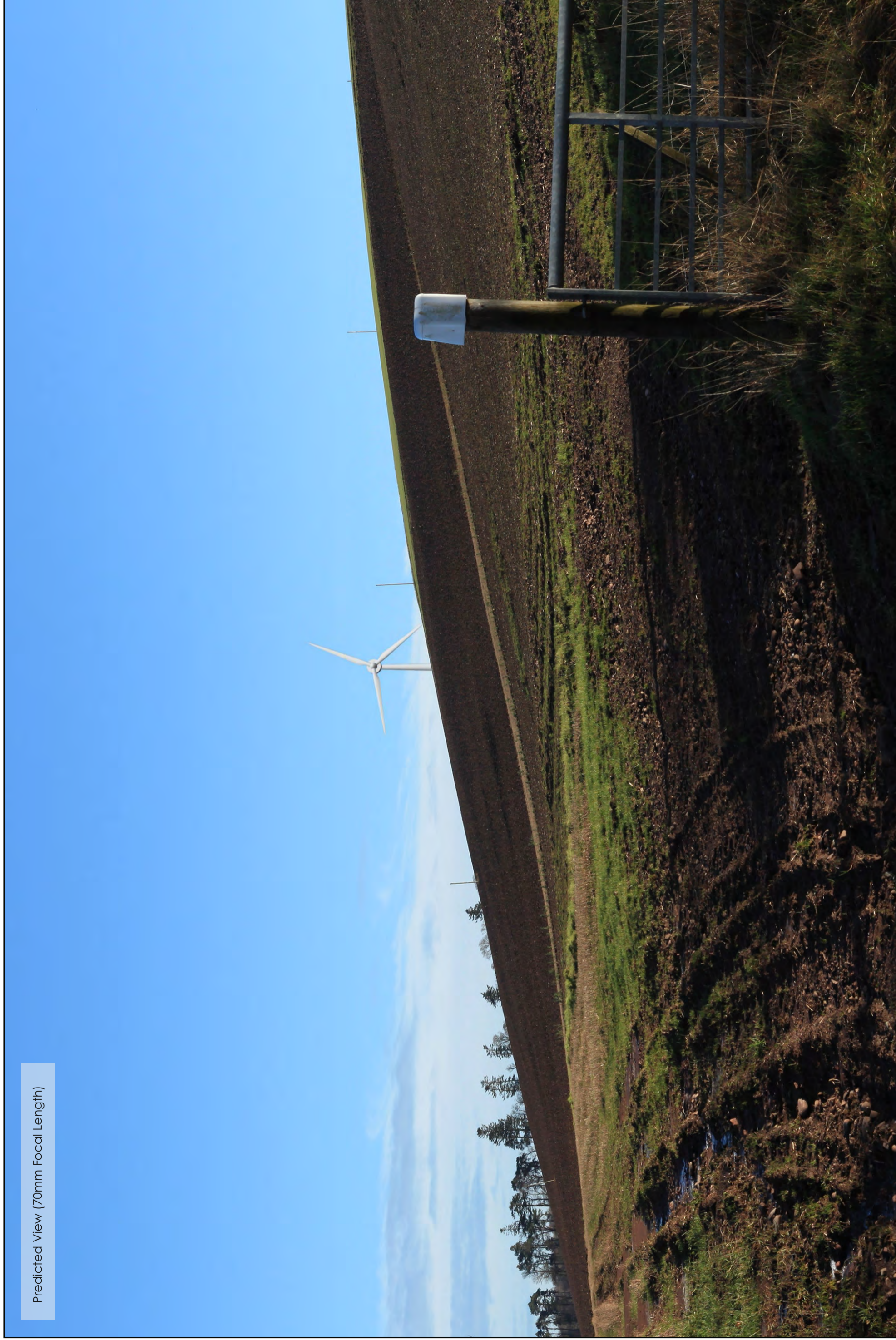
Figure 5-13c



Drawn by JM
 Checked by TP
 Approved by NT

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 10/2/2014
 4611_PM_C019b

Predicted View (70mm Focal Length)



Netherton Wind Turbine



Figure 5-14a
Viewpoint 10 - Flemington Tower Aberlemno

Viewpoint Data
Grid Reference E352593, N755739
Elevation 122m AOD

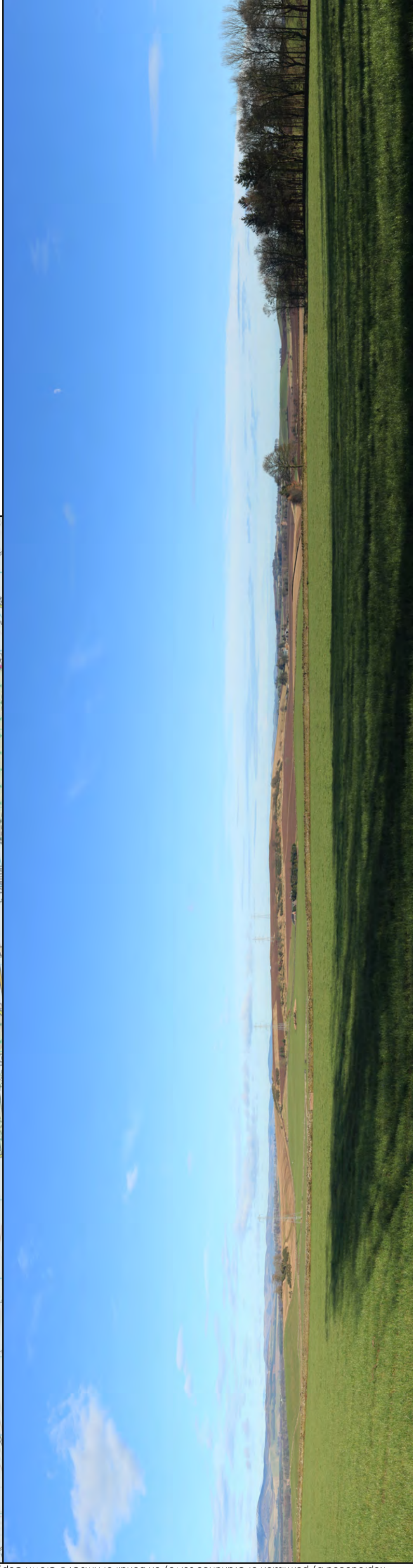
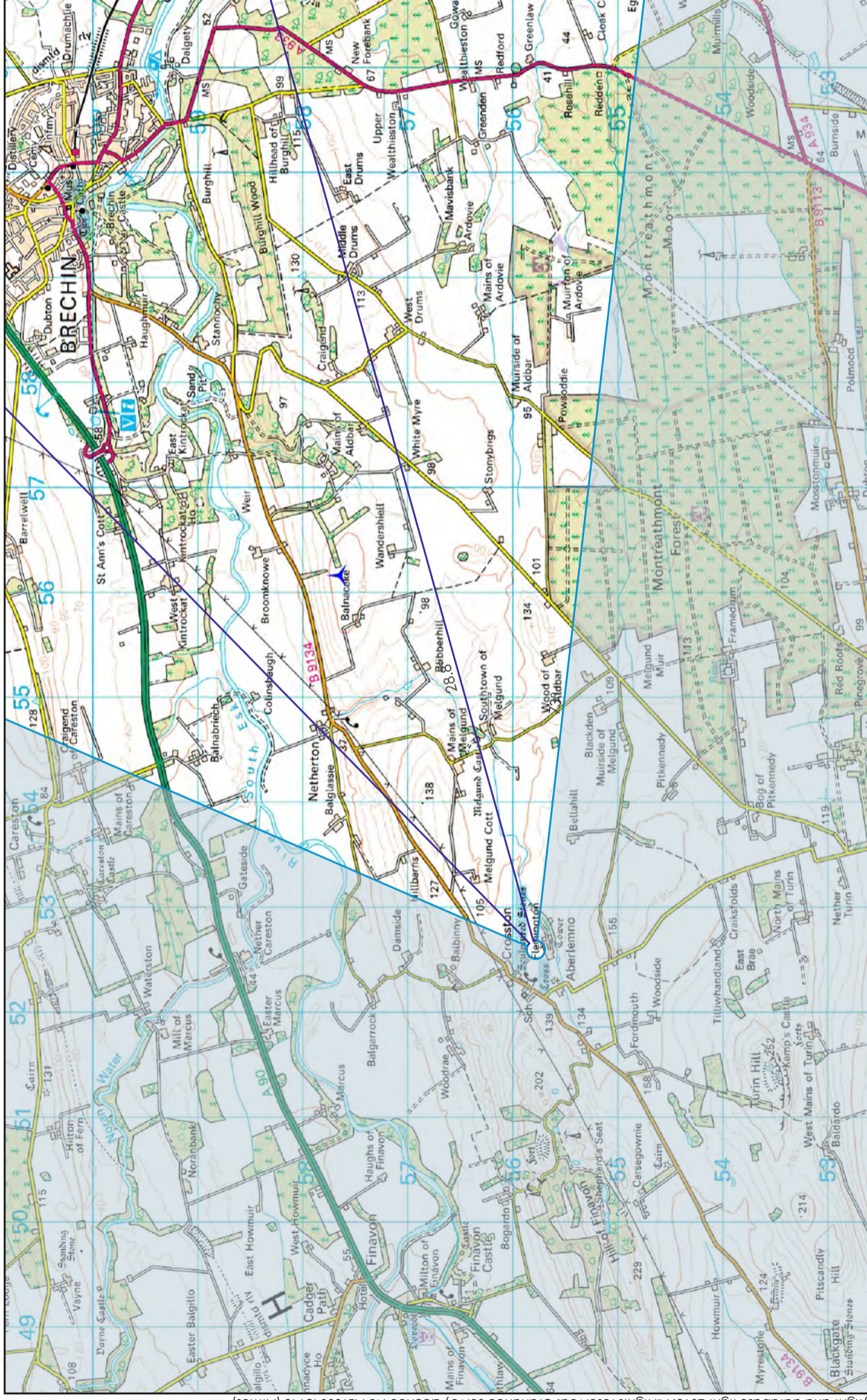
Wireframe/Photograph
Height above ground 1.6m
Camera and Lens Canon 5D SLR with fixed 50mm lens

Proposed Turbine Information (Netherton only)
Hub Height 40m
Blade Tip Height 67m

Predicted Wireframe Turbine Visibility (Netherton only)
Number of Turbine Tips Visible* 1
Number of Turbine Hubs Visible 1
Turbine Distance 4,061m



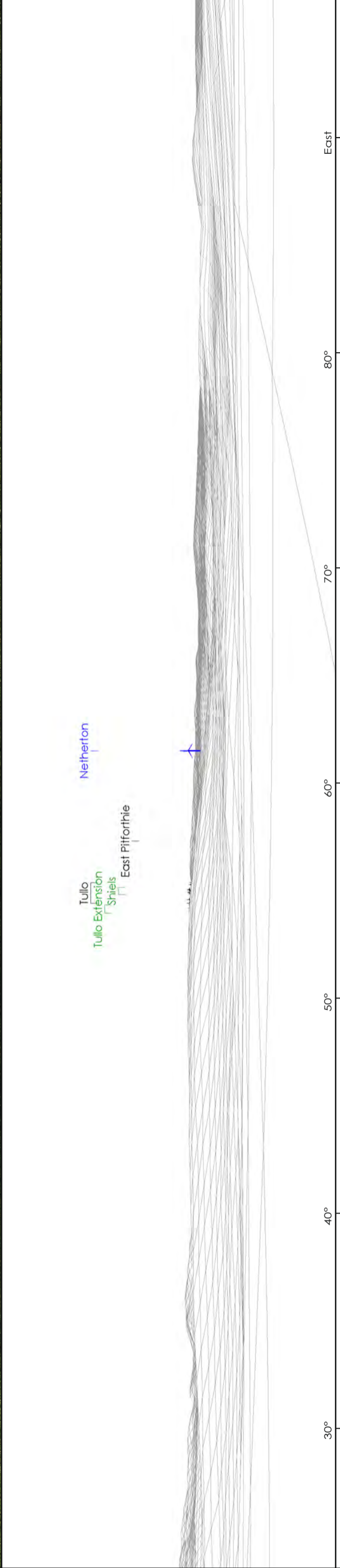
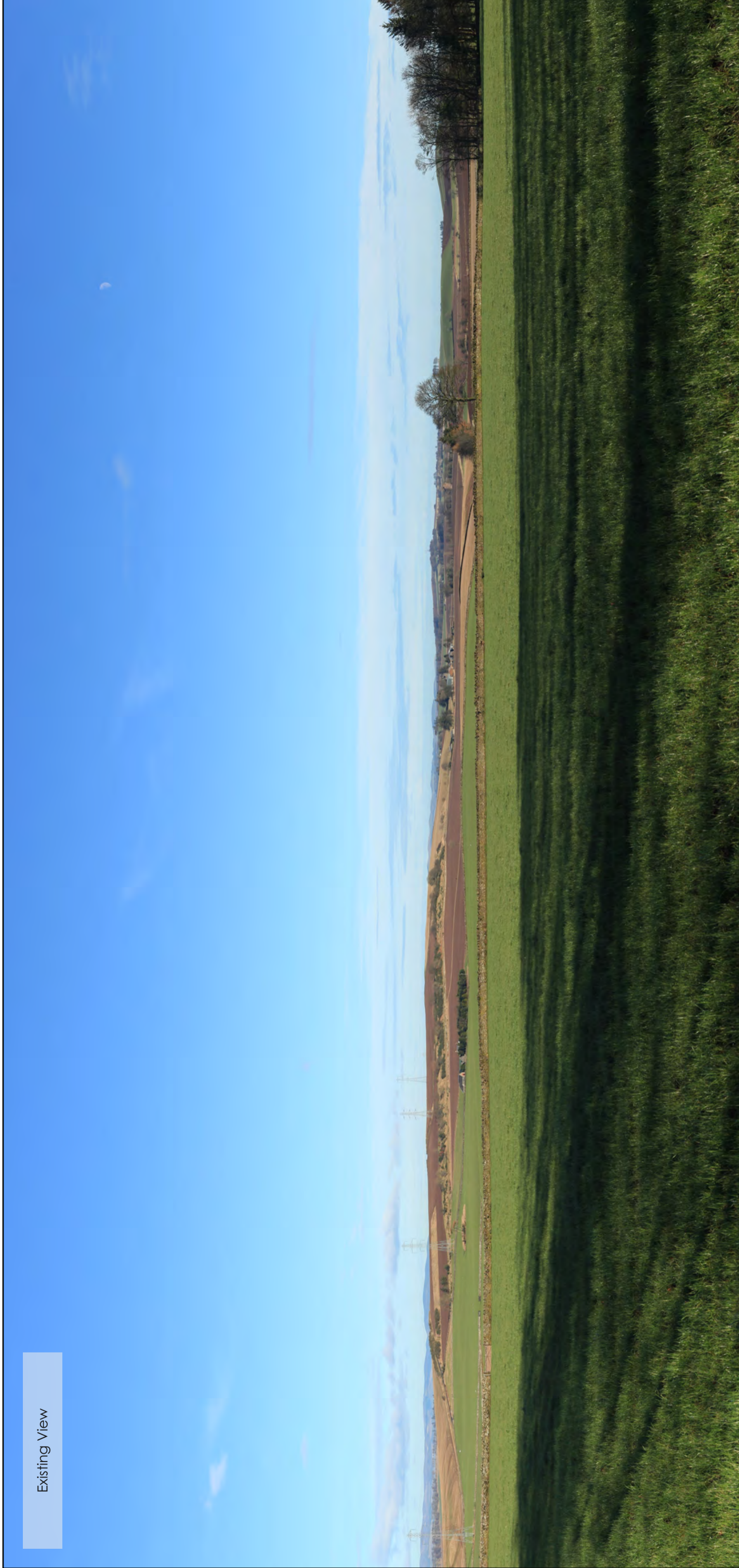
Wide Angle Photo of Existing View Included Angle 110° Approximate Viewing Distance 210mm



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Wireframes are generated using Ordnance Survey's Terrain 50 Dataset which does not take in to account the screening effects of buildings or vegetation.
*Refers to the number of turbines that blade tips can be seen rather than the number of individual tips seen from the viewpoint.

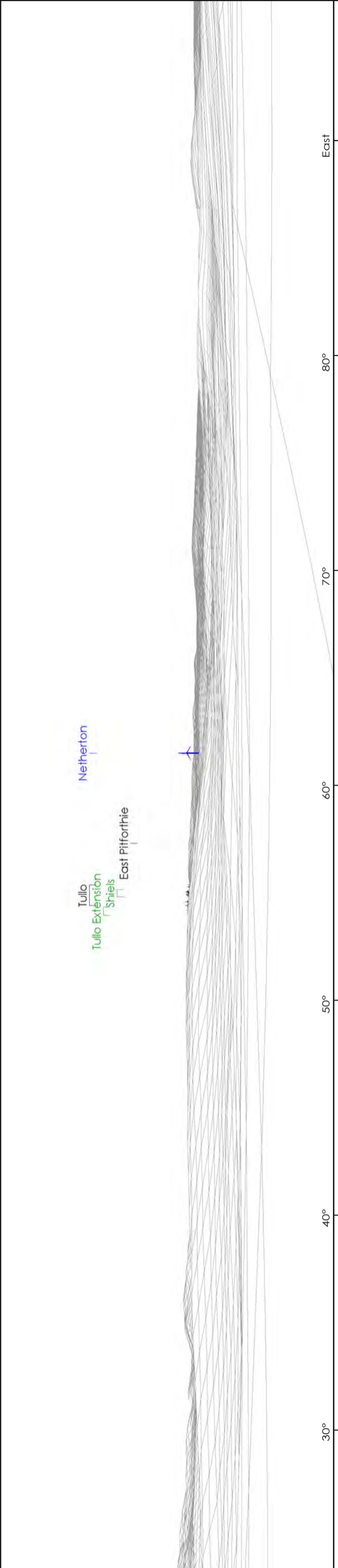
Existing View



	Polar Energy (Netherthon) Ltd	Netherthon Wind Turbine	Viewpoint 10: Flemington Tower Aberlemno	Horizontal View Angle Approximate Viewing Distance	73° 315mm	Figure 5-14b		Drawn by JM Checked by TP Approved by NT	T101c 10/2/2014 4611_PM_C020b
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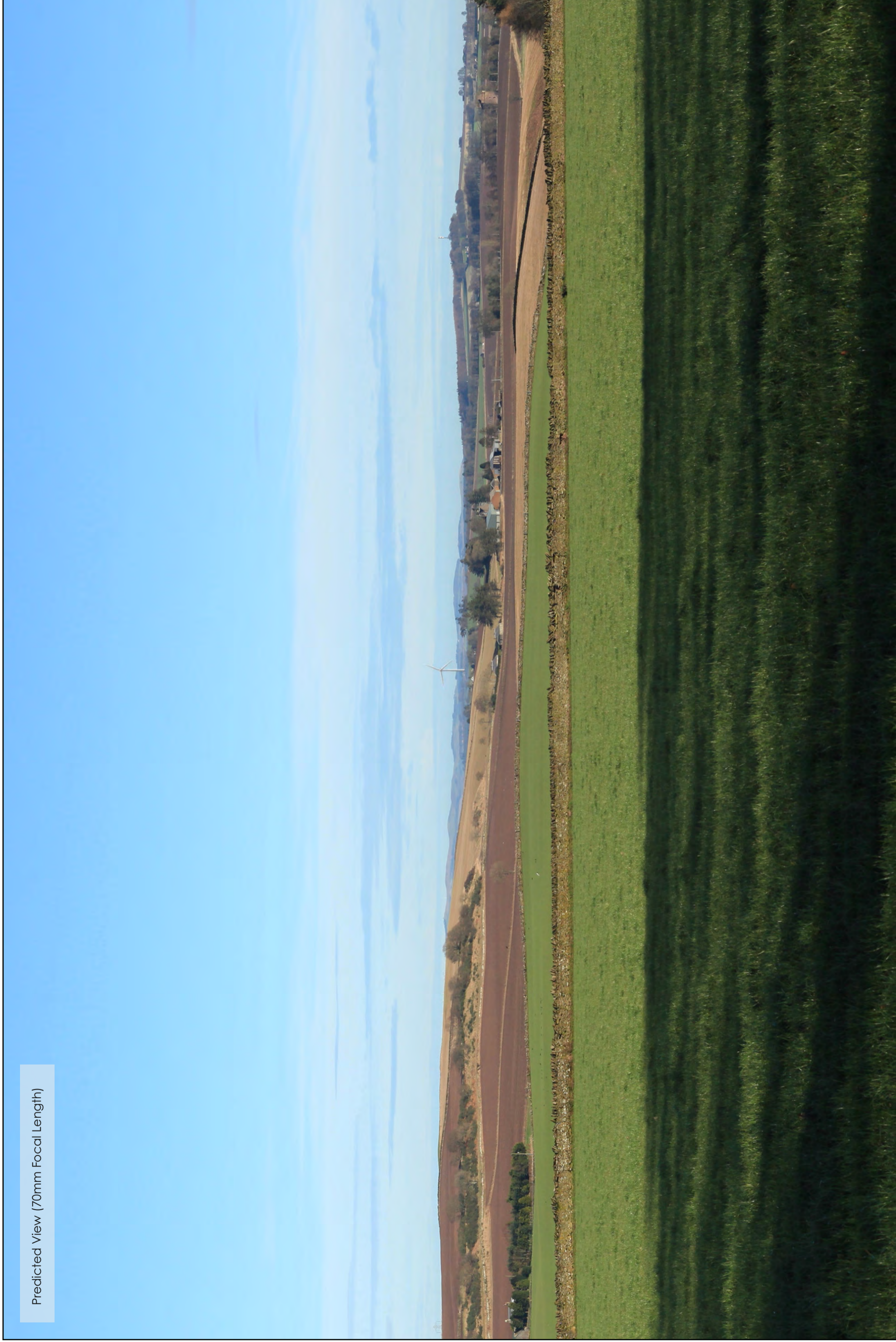
Predicted View

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	Polar Energy (Netherthon) Ltd	Netherthon Wind Turbine	Viewpoint 10: Flemington Tower Aberlemno	Horizontal View Angle Approximate Viewing Distance	73° 315mm	Figure 5-14c	 	Drawn by JM Checked by TP Approved by NT	T101c 10/2/2014 4611_PM_C020b
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Predicted View (70mm Focal Length)



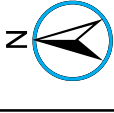
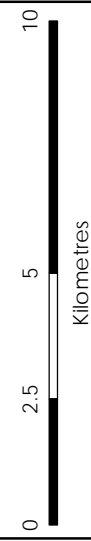
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-15
Cumulative Wind Farms

- Key**
-  Turbine location
 -  5km turbine radii to 20km
 -  Council boundary
 -  Cumulative Wind Farms (above 40m)
 -  Wind farm in planning
 -  Approved wind farm
 -  Operational wind farm
 -  Turbine in planning above 40m tip
 -  Approved turbine above 40m tip
 -  Operational turbine above 40m tip

Cumulative dataset statuses correct as of
24th January 2014

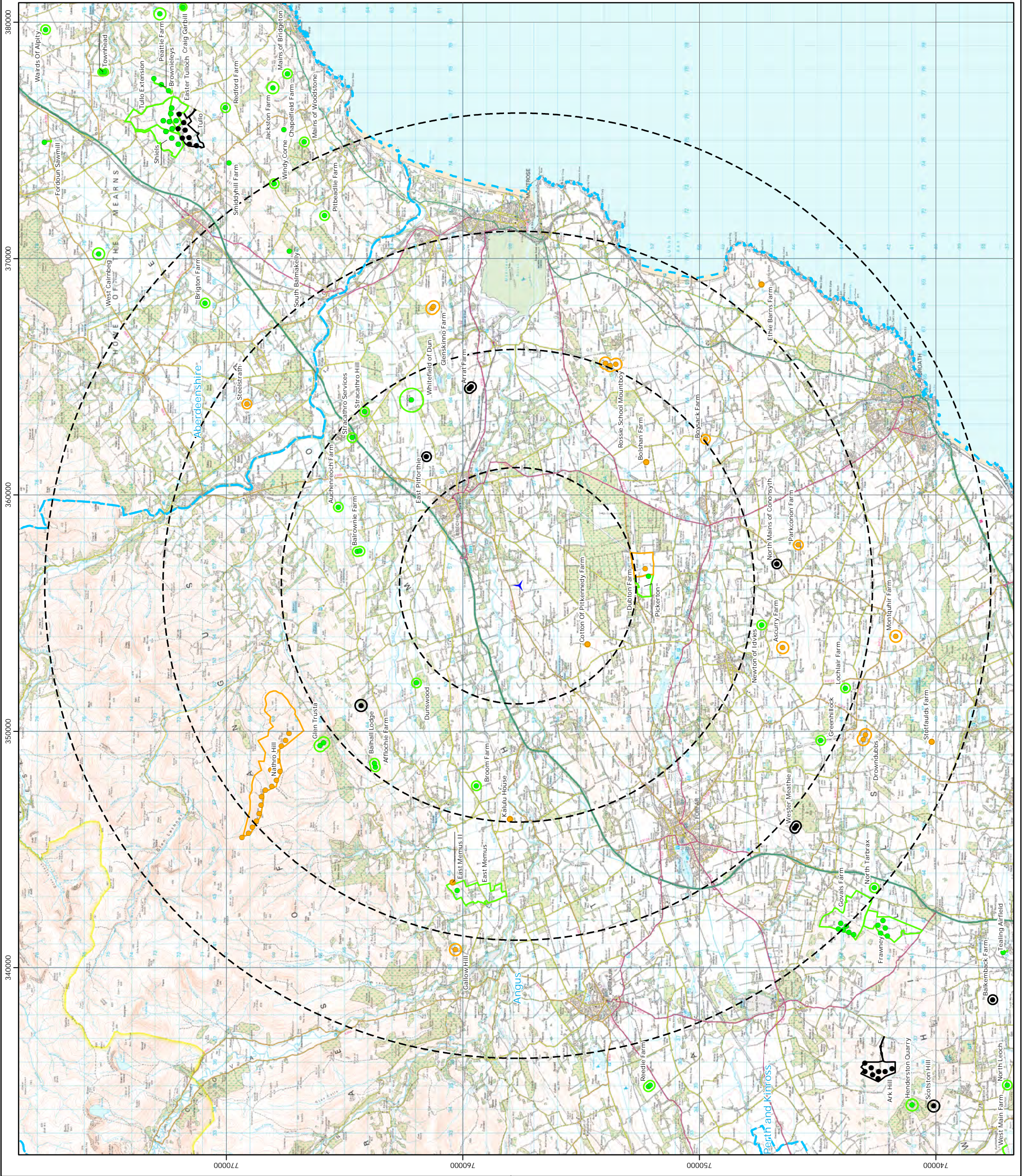


Scale @ A3:
1:150,000



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4611/L5/007a



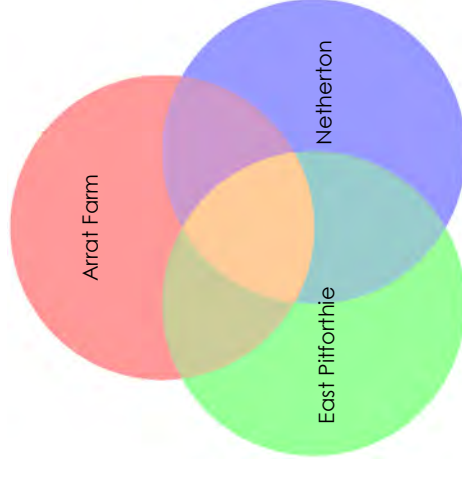
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-16a
Cumulative ZTV - Operational -
Netherton with East Pitforthie and Arrat
Farm

Key

- Netherton turbine (67m)
- Netherton 20km turbine buffer
- East Pitforthie turbine (47m)
- East Pitforthie 15km turbine buffer
- Arrat Farm turbine (46.5m)
- Arrat Farm 15km turbine buffer



Generated using Ordnance Survey's Terrain50
Dataset which does not take in to account
the screening effects of buildings or vegetation.

Curvature of the Earth allowed for.
Observer eye height 2m above ground.

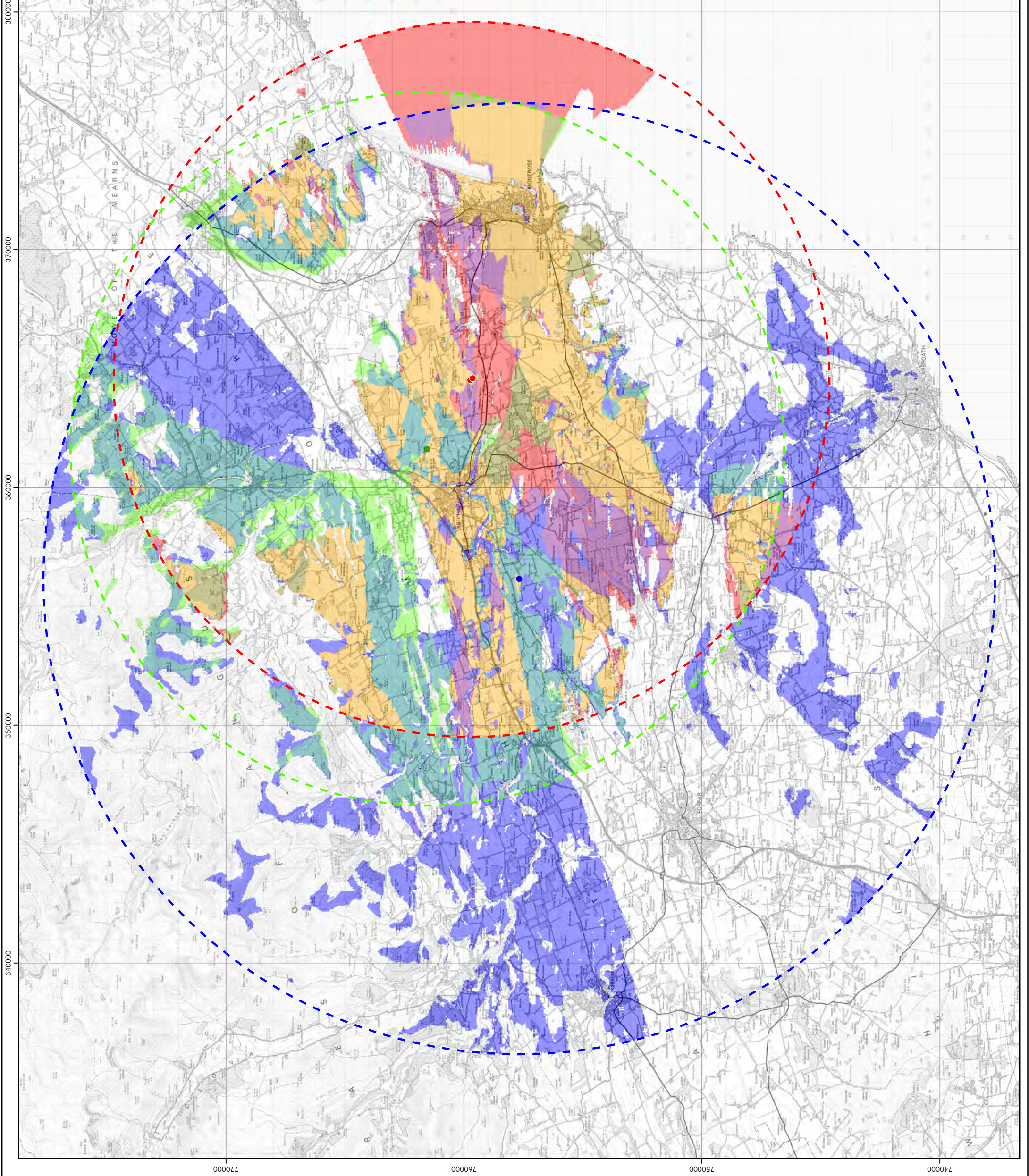
Distance of ZTV calculations based on SNH guidelines
51 to 70 m tip - 20 km
71 to 85 m tip - 25 km
86 to 100 m tip - 30 km
101 m to tip and above - 35 km



Scale @ A3:
1:150,000



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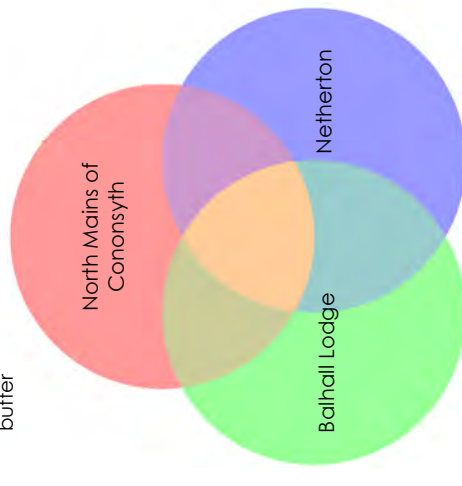
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-16b
Cumulative ZTV - Operational -
Netherton with Balhall Lodge and North
Mains of Cononsyth

Key

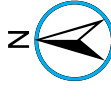
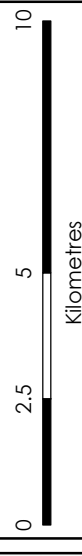
- Netherton turbine (67m)
- Netherton 20km turbine buffer
- Balhall Lodge turbine (48m)
- Balhall Lodge 15km turbine buffer
- North Mains of Cononsyth turbine (66.7m)
- North Mains of Cononsyth 20km turbine buffer



Generated using Ordnance Survey's Terrain50 Dataset which does not take in to account the screening effects of buildings or vegetation.

Curvature of the Earth allowed for.
Observer eye height 2m above ground.

Distance of ZTV calculations based on SNH guidelines
51 to 70 m tip - 20 km
71 to 85 m tip - 25 km
86 to 100 m tip - 30 km
101 m to tip and above - 35 km

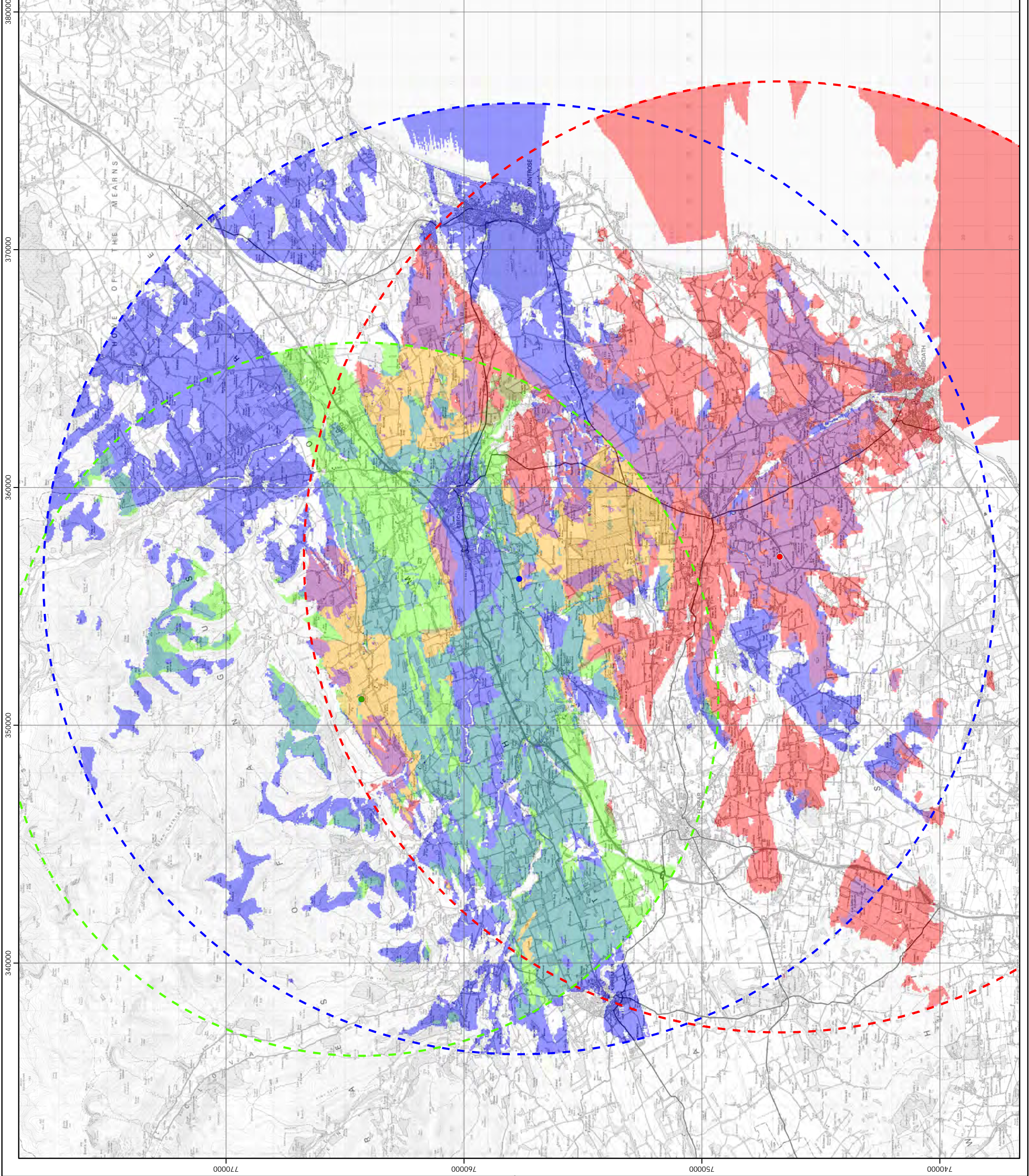


Scale @ A3:
1:150,000



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20/02/2014 TL01c 4611/ZV/010a
Drawn by: AA Checked by: TH Approved by: NT



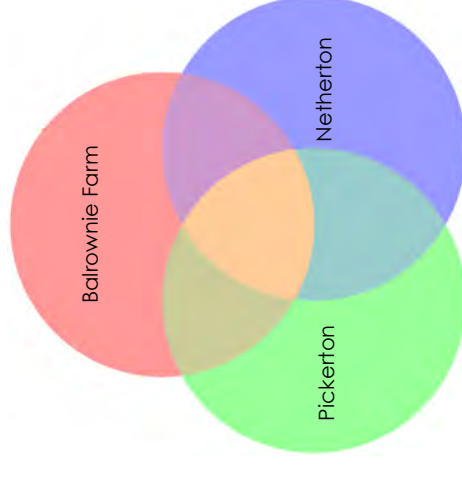
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-17a
Cumulative ZTV - Approved - Netherton
with Pickerton and Balrownie Farm

Key

- Netherton turbine (67m)
- Netherton 20km turbine buffer
- Pickerton turbine (77m)
- Pickerton 25km turbine buffer
- Balrownie Farm turbine (46.5m)
- Balrownie Farm 15km turbine buffer

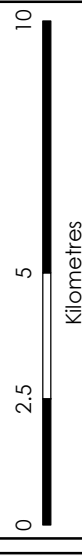


Generated using Ordnance Survey's Terrain50
Dataset which does not take in to account
the screening effects of buildings or vegetation.

Curvature of the Earth allowed for.
Observer eye height 2m above ground.

Distance of ZTV calculations based on SNH guidelines
51 to 70 m tip - 20 km
71 to 85 m tip - 25 km
86 to 100 m tip - 30 km
101 m to tip and above - 35 km

atmos
CONSULTING



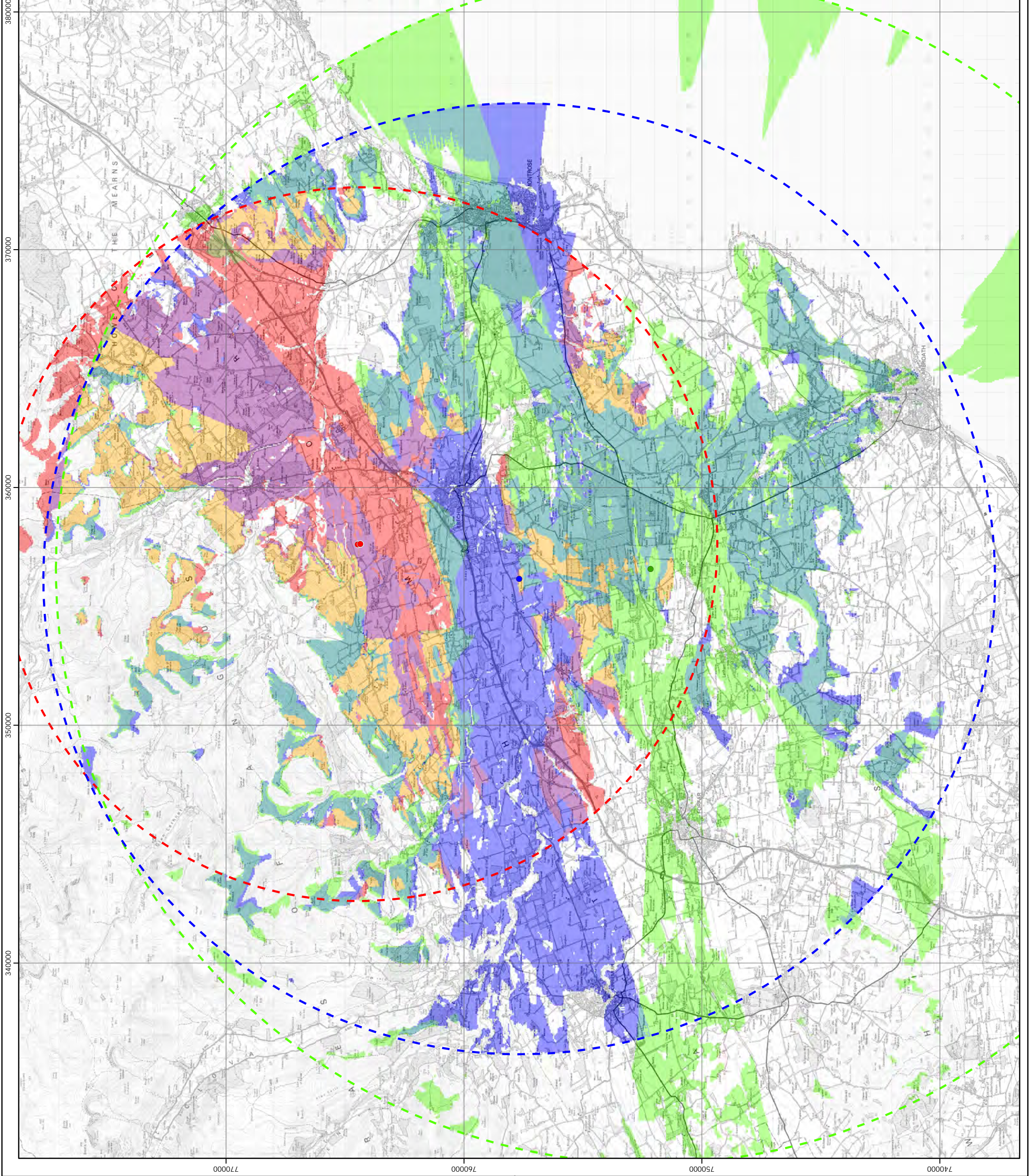
Scale @ A3:
1:150,000



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20/02/2014 TL01c
Drawn by: AA Checked by: TH Approved by: NT

4611/ZV/010a



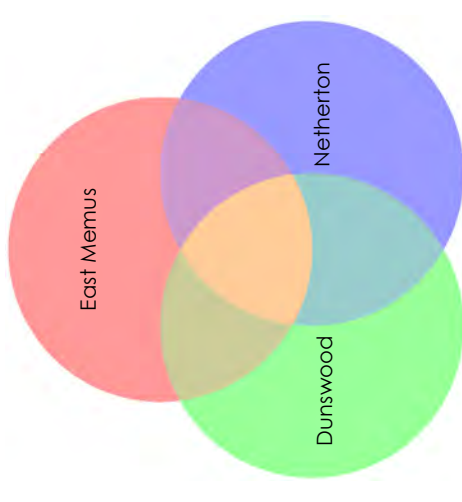
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-17b
Cumulative ZTV - Approved - Netherton
with Dunswood and East Memus

Key

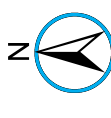
- Netherton turbine (67m)
- Netherton 20km turbine buffer
- Dunswood turbine (77m)
- Dunswood 25km turbine buffer
- East Memus turbine (86.5m)
- East Memus 30km turbine buffer



Generated using Ordnance Survey's Terrain50 Dataset which does not take in to account the screening effects of buildings or vegetation.

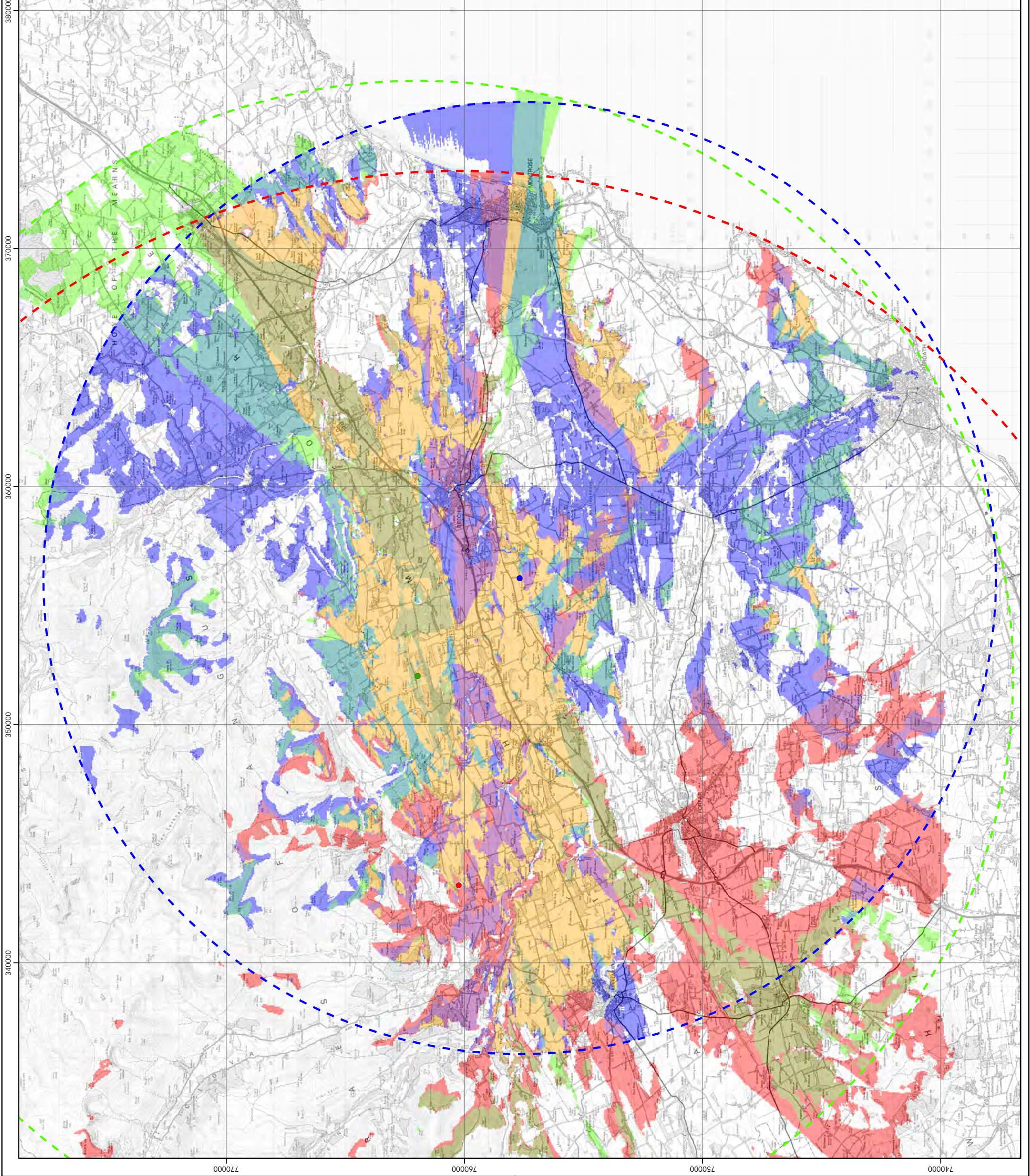
Curvature of the Earth allowed for.
Observer eye height 2m above ground.

Distance of ZTV calculations based on SNH guidelines
51 to 70 m tip - 20 km
71 to 85 m tip - 25 km
86 to 100 m tip - 30 km
101 m to tip and above - 35 km



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20/02/2014 TL01c 4611/ZV/010a
Drawn by: AA Checked by: TH Approved by: NT



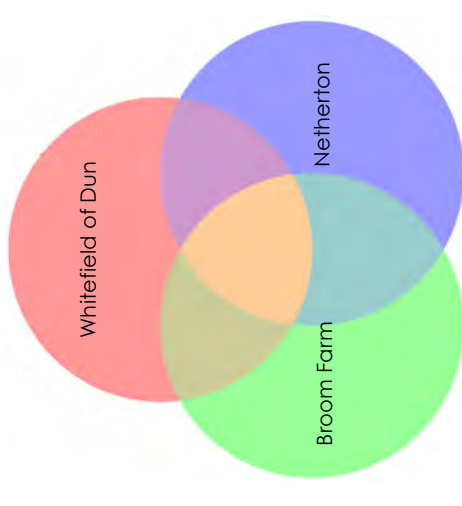
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-17c
Cumulative ZTV - Approved - Netherton
with Broom Farm and Whitefield of Dun

Key

- Netherton turbine (67m)
- Netherton 20km turbine buffer
- Broom Farm turbine (49.5m)
- Broom Farm 15km turbine buffer
- Whitefield of Dun turbine (67m)
- Whitefield of Dun 20km turbine buffer

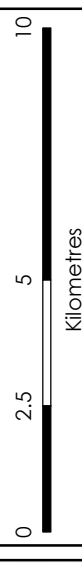


Generated using Ordnance Survey's Terrain50
Dataset which does not take in to account
the screening effects of buildings or vegetation.

Curvature of the Earth allowed for.
Observer eye height 2m above ground.

Distance of ZTV calculations based on SNH guidelines
51 to 70 m tip - 20 km
71 to 85 m tip - 25 km
86 to 100 m tip - 30 km
101 m to tip and above - 35 km

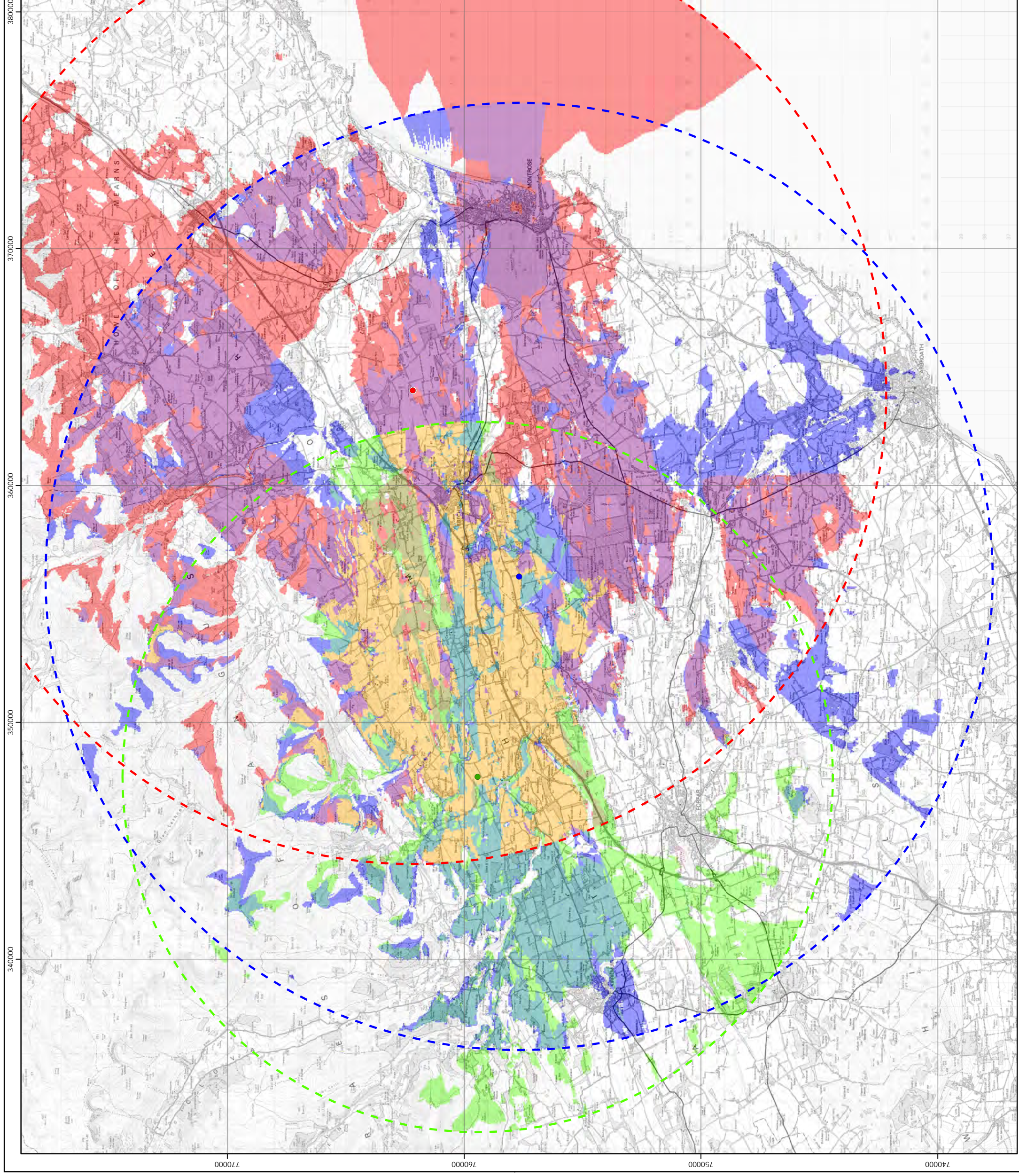
atmos
CONSULTING



Scale @ A3:
1:150,000

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20/02/2014 TL01c 4611/ZV/010a
Drawn by: AA Checked by: TH Approved by: NT



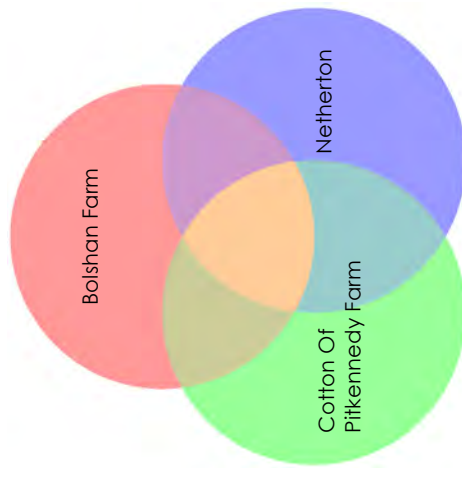
Netherton Wind Turbine

Polar Energy (Netherton) Ltd

Figure 5-18a
Cumulative ZTV - In planning -
Netherton with Cotton Of Pitkenedy
Farm and Bolshan Farm

Key

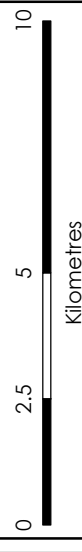
- Netherton turbine (67m)
- Netherton 20km turbine buffer
- Cotton Of Pitkenedy Farm turbine (74m)
- Cotton Of Pitkenedy Farm 25km turbine buffer
- Bolshan Farm turbine (102m)
- Bolshan Farm 35km turbine buffer



Generated using Ordnance Survey's Terrain50 Dataset which does not take in to account the screening effects of buildings or vegetation.

Curvature of the Earth allowed for.
Observer eye height 2m above ground.

Distance of ZTV calculations based on SNH guidelines
51 to 70 m tip - 20 km
71 to 85 m tip - 25 km
86 to 100 m tip - 30 km
101 m to tip and above - 35 km

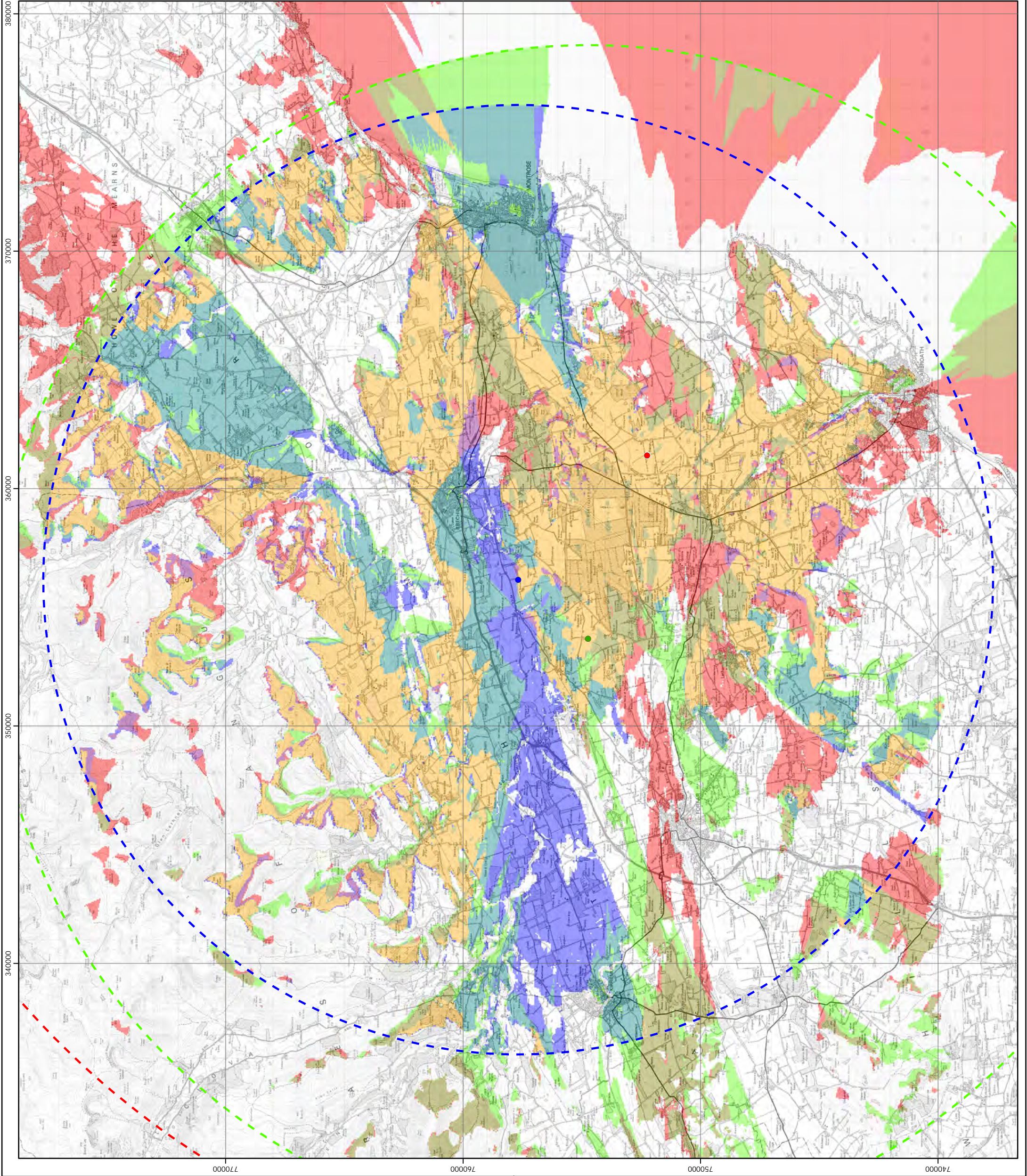


Scale @ A3:
1:150,000



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20/02/2014 TL01C 4611/ZV/010a
Drawn by: AA Checked by: TH Approved by: NT



6 Ecology and Ornithology

6.1 Introduction

Although a small scale, single turbine development, there is still potential to affect the ecological and ornithological receptors on site with potential impacts occurring during the construction, operational and decommissioning phases of the project.

The single turbine and associated infrastructure (upgraded track, new track and crane hardstanding) and associated planning application buffer is hereafter referred to as the 'Site' (Figure 1-1). In this section independent advice on the potential effects of the development on the nature conservation interest of the Site and its immediate environs is presented with an assessment of potential constraints to the development posed by the ecology and ornithology and its surroundings.

6.2 Methodology and Approach

6.2.1 Information Sources

Several sources of information were used to inform this chapter. Information on statutory sites was obtained from the website of the statutory agency SNH via the 'Site Link Portal' (<http://www.snh.org.uk/snhi/>). Search areas were 10km for sites designated for ecological features, and 20km for sites designated for ornithological features. A search was also conducted for (internationally to nationally) protected species records within the NO55 10km Grid Square on the National Biodiversity Network (NBN) Gateway website (<http://www.searchnbn.net/>) to further inform the impact assessment.

Aerial photography of the Site was examined using photography available in the public domain on the www.bingmaps.co.uk and www.maps.google.co.uk web pages.

The following sources of information were used:

- Results of internet searches as detailed above;
- UK Biodiversity Action Plan (UK BAP); and
- Tayside Local Biodiversity Action Plan (TLBAP).

The proposed Site is covered by the Tayside Local Biodiversity Action Plan (NES LBAP) covering both the Angus and Perth & Kinross Council areas. Relevant aspects of the Tayside LBAP include Species Action Plans (HAPs) for 'barn owl (*Tyto alba*), red squirrel (*Sciurus vulgaris*), otter (*Lutra lutra*), Atlantic salmon (*Salmo salar*) and bat (f. *Vespertilionidae*) species'.

A desktop search was also undertaken for publicly available information in relation to existing or proposed wind farms within 10km of the proposed Site. The Environmental Statements (ES) or Non-technical Summaries (NTS) referenced included:

- Dubton Farm (5.7 km from the Site);
- Dunswood (5.7km from the Site);
- Balrownie (6.7km from the Site);
- Auchenreoch Farm (8.2km from the Site)
- Kallulu House (8.4km from the Site) and;

- Afflochie Farm (9.4km from the Site).

6.3 Results

6.3.1 Site Description

The proposed development site is located on part of Balnacake farm on land which is currently used for agriculture. The site lies approximately 6km southwest of Brechin and approximately 12km northeast of Forfar. Figure 1-2 shows the site location.

There are no properties located within 400m of the proposed turbine location. The closest property is the Balnacake residential property approximately 450m southwest of the proposed turbine location. The closest non-residential property is Broomknowe Cottage approximately 560m northeast of the proposed turbine location

6.3.2 Designated sites

There are no statutory or non-statutory designated areas for ecology or ornithology within the boundary of the Site. However, there is one statutory designated site in close proximity of the Site, the River South Esk Special Area of Conservation (SAC). This site, comprising of the South Esk River (and selected tributaries) is approximately 750m from the development Site. The SAC site is internationally designated for aquatic species; Atlantic salmon and Freshwater pearl mussel (*Margaritifera margaritifera*).

Outwith 5km the nearest statutory designated site is Rescobie and Balgavies Lochs Site of Special Scientific Interest (SSSI) located approximately 6km from the Site, designated for habitats features. There are three further sites designated for ecological features located within 10km of the Site boundary, these are Restenneth Moss SSSI (8km), Rossie Moor SSSI (9km) and Dun's Dish SSSI (9km), the latter also having ornithological qualifying features. Further details of all designations are presented below in Table 6-1.

Other than Dun's Dish SSSI, the closest designated site with ornithological qualifying features is the Montrose Basin Special Protection Area (SPA), Ramsar and SSSI 10 km south east of the Site. The site qualifies for designation as an SPA under Article 4.1 of the Birds Directive (2009/147/EC) by supporting non-breeding populations of European importance of Annex 1 species; Pink-footed Goose (*Anser brachyrhynchus*) and Icelandic Greylag Goose (*anser anser*).

There are two further SPAs within 20km of the Site boundary, these are Cairngorms Massif SPA (15km), designated for breeding Golden eagle (*Aquila chrysaetos*) populations and Loch of Kinnordy SPA (18km), designated for supporting non-breeding Pink-footed Goose and Icelandic Greylag Goose. A further site designated for ornithological features is, Whiting Mess SSSI, located 15km southeast of the Site. It is designated for breeding seabird species and non-breeding wader species and well as invertebrates and habitats. Further details of all designations and qualifying features are presented below in Table 6-1.

Table 6-1: Designated Sites within Study Area

Site details	Feature type	Qualifying features
River South Esk SAC Distance from the Site: <1km	Ecology	Atlantic salmon Freshwater pearl mussel
Montrose Basin SPA, Ramsar, SSSI	Ornithology	Dunlin (<i>Calidris alpina alpina</i>) - non-breeding

Site details	Feature type	Qualifying features
Distance from the Site: 10km	Ecology	Eider (<i>Somateria mollissima</i>) - non-breeding Greylag goose - non-breeding Knot (<i>Calidris canutus</i>) - non-breeding Pink-footed goose - non-breeding Redshank (<i>Tringa tetanus</i>) - non-breeding Wigeon (<i>Anas Penelope</i>) - non-breeding Waterfowl assemblage - non-breeding Oystercatcher (<i>Haematopus ostralegus</i>) - non-breeding Shelduck (<i>Tadorna tadorna</i>) - non-breeding Saltmarsh habitat Transitional saltmarsh habitat Mudflats habitat Golden eagle -breeding
Cairngorms Massif SPA Distance from the Site: 15km	Ornithology	
Loch of Kinnordy SPA, Ramsar, SSSI Distance from the Site: 18km	Ornithology	Greylag goose - non-breeding Pink-footed goose - non-breeding Breeding bird assemblage Open water transition fen habitat Eutrophic loch habitat
Rescobia and Balgavies Lochs SSSI Distance from the Site: 6km	Ecology	Basin fen habitat Transition fen habitat Vascular plant assemblage
Restenneth Moss SSSI Distance from the Site: 8km	Ecology	Basin Fen habitat
Rossie Moor SSSI Distance from the Site: 9km	Ecology	Lowland dry heath habitat Valley Fen habitat Dipteran (fly) assemblage Coleopteran (beetle) assemblage
Dun's Dish SSSI Distance from the Site: 9km	Ornithology Ecology	Breeding bird assemblage Open water transition fen Eutrophic loch
Whiting Mess Distance from the Site: 15km	Ornithology Ecology	Fulmar (<i>Fulmarus glacialis</i>) - breeding Kittiwake (<i>Rissa tridactyla</i>) - breeding Puffin (<i>Fratercula arctica</i>) - breeding Shag (<i>Phalacrocorax aristotelis</i>) - breeding Purple sandpiper (<i>Calidris maritima</i>) - non-breeding Turnstone (<i>Arenaria interpres</i>) - non-breeding Small blue butterfly (<i>Cupido minimus</i>) Lowland neutral grassland habitat

6.3.3 Habitats and Vegetation

The turbine is located within an arable field located approximately 450m from an existing farm track and 150m from the B9134. Agricultural drainage and issues are found south of the field with no significant riparian buffer strips present. A small strip of coniferous woodland is present 115m east of the proposed turbine location, and scattered mixed trees can be found on the arable field margin by the B9134.

The Site does not support any areas of habitat identified as being potentially dependent on groundwater and the agricultural nature of the surrounding landscape results in no significant areas of potentially groundwater dependent habitat within 250m of the proposed scheme.

Four areas of ancient woodland (long established woodland of plantation origin) are located within 2km of the Site, but none are present within or immediately adjacent (<1km) to the Site.

6.3.4 Fauna

From NBN data searches, records for a number of internationally and nationally protected or priority species are present within the wider area, but no records are located within the Site. A total of 6 avian species and 3 mammal species were recorded within the search area (10km grid square NO55), these are listed in Table 6-2 below.

Table 6-2: Protected and Priority Species within the Study Area

Avian species	SBL*	UK BAP*	Schedule 1*	Annex 1*
Barn Owl (<i>tyto alba</i>)	x		x	
Barnacle Goose (<i>Branta leucopsis</i>)	x			x
Common Kingfisher (<i>Alcedo atthis</i>)	x		x	x
Osprey (<i>Pandion haliaetus</i>)			x	x
Scottish Crossbill (<i>Loxia scotica</i>)	x	x	x	x
Capercaillie (<i>Tetrao urogallus</i>)	x	x	x	x
Non-avian species	SBL	UK BAP	SAP*	Habitats Directive*
Brown Long-eared Bat (<i>Plecotus auritus</i>)	x	x		x
Red Squirrel (<i>Sciurus vulgaris</i>)	x	x	x	
Otter (<i>Lutra lutra</i>)	x	x		x
International				
Annex 1*: EU Protected avian species under Annex 1 of EU Birds Directive Habitats Directive* - EU Protected species under EU Habitats Directive				
National				
Schedule 1* - Avian species protected under the Wildlife & Countryside Act (WANE Act) SBL*: Listed priority species on the Scottish Biodiversity List UKBAP* - Listed in the UK Biodiversity Action Plan, as a priority species. SAP* - Listed priority species on the UK Species Action Plan.				

Further details of the above species are given within this section (6.3.4) in the paragraphs below. No nationally or internationally protected amphibian, reptile, invertebrate, floral species or aquatic species were recorded within the search area.

Ornithology

The Site lies within an area of low sensitivity for birds as per RSPB/SNH report Bird Sensitivity Map, (http://www.rspb.org.uk/Images/sensitivitymap_tcm9-157991.pdf) a data source compiled to provide locational guidance for onshore wind farms in Scotland (J. A. Bright et al., 2006).

The agricultural setting in which the site is located provides suitable habitat for the barn owl. This schedule 1 species has been recorded at two unspecified locations within 2km of the site. Barn owls are low-flying birds, typically flying at approximately 3m above

ground, putting them out of range of typical rotor swept heights and therefore at low risk from turbine collision. There is currently no known evidence to suggest that wind turbines in the UK are having a significant effect on Barn Owls (Barn Owl Trust, 2013). Additionally, there is also no suitable roosting potential for barn owl within 400m of the turbine location.

Barnacle geese have been recorded on numerous occasions within the NO55 grid square. However these records are all found at the Montrose Basin, an SPA site for overwintering goose species (see Table 6-1). The closest of these records was 11km from the site. Given the distance from the Montrose Basin SPA (as well as Loch of Kinnorady SPA) and lack of goose records within 11km of the site, evidence suggests that no goose species are using the site for grazing, despite the arable habitats. Additionally, it is likely that any geese (inclusive of barnacle geese) flying over the site will be heading towards grazing and roosting sites (on or near SPAs), and therefore will be flying at heights well above the rotor swept height, putting them at no risk from turbine collision.

A two turbine site at Dubton Farm has been consented 5.7km from Netherton. This site lies on similar arable habitat at the same distance (11km) from Montrose Basin as the Netherton site. SNH's response to the submission stated that "fields in and around the proposed development do not form part of the preferred foraging areas for pink-footed or greylag geese. Therefore, we consider there is no likely significant effect on the SPA qualifying species."

Two historical records of Kingfisher were recorded on watercourses within 2km of the site boundary. Kingfisher predominantly inhabits stream and riverbanks, and roosts in scrubs close to shallow open water. The species are unlikely to move away from close proximity to these riparian habitats and are a low-flying species, therefore are not considered to be at risk of turbine collision.

Ospreys are an annex 1 protected species; however the closest records of the species within NO55 are 11km from the site. Osprey is a summer migrant to the UK, and nests next to or nearby large water-bodies which provides their food source. As there are no suitable large water bodies within 10km of the site, it is very unlikely that Osprey would be recorded on or in flight over the site.

Individual recent records of both Scottish crossbill and capercaillie can be found within 10km of the Site. However, the habitats on and within proximity of the Site are unsuitable for both species, which typically inhabit native pine-forests (and other coniferous woodland). It is likely that both species were recorded within the Montreathmont Forest, a site known to contain capercaillie leks (breeding areas). It is very unlikely that either species would move out-with a forested area, particularly Capercaillie which is a poor (low height) flier.

Ecology

The intensive agricultural setting of the site is generally unsuitable for non-avian protected species such as badger, pine marten, water-vole and reptiles. No records of any of these species were found within the NO55 grid square.

Two records of brown long-eared bat are present within 5km. No suitable roosting habitats are present within the Site, or within 200m of the proposed turbine. Bat foraging opportunities are limited to ditch networks and woodland strips within the wider landscape, all in excess of 100m from proposed turbine blade tip to potential bat feature. The presence of soprano pipistrelle, the most common and widespread

species in the Scotland, was recorded during surveys for the consented Dunswoods wind turbine site (see section 6.2.1). It was assessed that this species was not at risk from the proposed development.

Although habitat for otter exist within the wider area (two records within 5km of the Site) no suitable habitat is located within, or in close proximity (<200m) to the Site. Although the site is located 750m from a major watercourse, the habitat on site is unsuitable for otter use (both foraging and commuting), and no records for the species exist within 1km of the Site. It is therefore very unlikely that otter would use the site.

Numerous records of Red squirrel were found in the wider area, however these are confined to areas of woodland, particularly within Montreathmont Forest. With only 1 small strip of woodland within 200m, it is extremely unlikely that red squirrel would be present near or within the Site.

The Site is located within the wider River North Esk catchment which is identified as salmonid waters under the Freshwater Fish Directive. Additionally it lies 750m out-with the South River Esk SAC (see table 6-1), a site designated for both Atlantic salmon and freshwater pearl mussel populations. There are no agricultural burns or other minor watercourses on, or nearby the site that have potential to support either species or be potentially connected to the SAC. Additionally no records over either species have been found within 10km of the Site.

6.4 Conclusions and Recommendations

There is only one statutory or non-statutory designated site within 5km of the Site, the River South Esk SAC. This site is designated for aquatic species which have not been recorded within 10km of the site and are restricted to riparian features. No suitable watercourses for either species are present on site, and the SAC shares no connectivity with the Site.

The wind turbine location on site has been selected to minimise the potential for impact on the local ecology: it is within an agricultural field and is situated at least 100m from trees and hedgerows which form the field boundary.

The Site itself does not have any habitats of nature conservation value or habitats which would be of value for any protected species and no records of protected species within or immediately adjacent to the Site exist.

The habitats around the Site although not of conservation value in themselves are capable of supporting some protected species such as foraging and commuting bats, otter, and red squirrel. Records of protected non-avian species are also absent from the Site and immediate environs.

Although the site and its environs have the potential to support barn owl, this species is not considered at risk from turbine collision due to its low flight height, and not likely to roost within 400m of the proposed turbine location. No other protected avian species are likely to use the site for roosting or foraging, or are considered to be at risk from turbine collision.

Due to the low environmental value of the Site, and range of known species in the area, we therefore consider that there is no potential for significant impact to ecological or ornithological receptors during the construction, operational and decommissioning phases of the project.

7 Hydrology, Hydrogeology and Geology

7.1 Introduction

The construction, operation and decommissioning phase of a single wind turbine development has the potential to affect the hydrology and hydrogeology within the localised area via:

- Erosion and sediment transport;
- Potential polluting events affecting groundwater and surface water quality;
- Alteration of natural drainage patterns/runoff volumes and rates; and
- Increase in the magnitude or frequency of flood events.

The significance of the effect that the wind turbine development will have on the water and soil environment of the area will vary according to the magnitude of the potential effects and the sensitivity of the receptors.

7.2 Baseline Conditions

7.2.1 Topography and Climate

The development area generally comprises of arable farm land on the northern slope of small hill, near the Balnacake Farm property. The development will use the existing entrance from the public road B9734 towards Balnacake Farm. A new access track will be developed from north of Balnacake Farm to the turbine.

Site levels range from approximately 54m above Ordnance datum in the north to approximately 110m above Ordnance datum in the south. The site generally slopes steeply to the north. The turbine is positioned on a less steep section of the slope towards the hill summit at around 110m above Ordnance datum. Average annual rainfall based on the Centre for Ecology and Hydrology (CEH) Website's spatial data map indicates the Standard Average Annual Rainfall (SAAR) from the 1960-1991 database to be between 750 and 800mm per year. The average rainfall for the River South Esk Catchment is 1093mm and for the local sub-catchment of Melgund Burn is 800mm based on the FEH CD ROM. This is considered to be a moderately dry climate for Scotland. Runoff from the development area is likely to be low, although during heavy rainfall events the runoff down the northern hill slopes could increase.

7.2.2 Catchment Hydrology

The majority of the runoff from the site flows to the north and northeast into un-named drains north of the B9734 public road or northeast into the Melgund Burn, which is a tributary of the River South Esk (Tayside). The drains to the north of the site appear to have been geomorphologically altered (or straightened) in parts for farming activities and therefore are not in their natural state. The Melgund Burn is a relatively steeply incised watercourse which appears to be culverted near the B9734 road beneath a recent housing development. The nearest water features potentially connected to the development are two field drains to the north located at least 300m from the access track and turbine.

The Melgund Burn is classified by the Scottish Environmental Protection Agency (SEPA) under their River Basin Management Plan (RBMP) as being of moderate ecological status as a result of diffuse source pollution and morphological changes from arable farming. The Melgund Burn catchment is a freshwater fish protected area for salmonids and is hydrologically linked to the River South Esk Special Area of Conservation (SAC) as part of the River Tay catchment.

No known designated areas are located within the proposed area or within 500m of the development area. The nearest designation is the River South Esk SAC located approximately 750m downstream of the development area designated for Atlantic salmon and Freshwater pearl mussel.

7.2.3 Flood Risk

No SEPA indicative flood plains are shown within the proposed development area.

The nearest SEPA indicated flood plain is greater than 150m down gradient of the access track and 500m down gradient of the turbine location associated with the River South Esk. This SEPA flood plain covers a wide area to north of the roads and roughly follows the 40m above Ordnance datum contour. There are properties or receptors shown to be at risk of flooding within the River South Esk flood plain. The Melgund Burn to the east of the development area also has a small indicative flood plain.

Anecdotal evidence from the landowner indicates there is no known localised flooding within the area and runoff is managed through the drains.

The risk of flooding within the development area and increasing the risk of flooding down gradient of the development area is low.

7.2.4 Geology

The drift or superficial geology underlying the all of the development area is shown to be Glacial Till comprising a diamicton of poorly sorted clay, sand and gravel.

No peat is shown on geological mapping within or near the development area.

The solid geology mapping shows the majority of the development area to be underlain by the Finavon Conglomerate Member comprising rounded clasts of sandstone and quartzite held together by a dark red sand and gravel matrix formed in the Devonian Period approximately 398 to 416 million years ago. To the south of the development area is underlain by the Scone Sandstone Formation. A fault is shown on geological mapping to trend northeast to southwest through the site. A geological fault line has the potential to act as a barrier for groundwater flow or more likely, a preferential pathway for groundwater flow.

The bedrock is classified as a locally important or low productivity aquifer, with any groundwater flow is generally constrained to being within fissures or discontinuities within the rock. Being a local aquifer, there is a potential for groundwater in the area to be used.

The development area is located on the South Esk bedrock and localised sand and gravel aquifer which is described by SEPA to be good in groundwater quantity and poor in relation groundwater quality as a result of diffuse pollution from arable farming. The site is within a groundwater Drinking Water Protection Area and Nitrate Vulnerable Zone.

7.2.5 Water Resources

No water abstraction features or infrastructure are shown on OS mapping or aerial mapping within or in close proximity to the development area. Anecdotal evidence from the landowner, Bill Lamb, has indicated that there are no known PWS sources in or within 250m of the development and that the nearest properties (Balnacake, Melgund Mill, Netherton and Broomknowe Cottages) are currently on mains water supply. Historically, during the 1920s and 1930s local farms were on private water supplies from several boreholes that are now obsolete.

There are no known PWS sources within 250m of the development, therefore the risks to water resources is low to negligible.

7.3 Impact Assessment

7.3.1 Sensitive Receptors

Sensitive receptors identified for the proposed development area include:

- Megland Burn and drains to north of B9734 for being potentially hydrologically linked to the River South Esk (Tayside) SAC approximately 500m downstream of the site – high sensitivity.
- Groundwater is considered to be of low sensitivity as little resource is present beneath and no receptors (human users or groundwater dependent terrestrial ecosystems) have been identified.
- Flood risk is of low sensitivity as no SEPA flood plain is shown within the site and the development involves a small proportion of land take.

7.3.2 Potential Impacts

The potential impacts from the construction of the proposed wind turbine development are summarised below:

- Potential risk to surface water from the introduction of sediment into surface water run-off following activities such as access track construction, and turbine excavation and the dewatering of excavations;
- Impacts on hydrogeology due to dewatering of foundation excavations;
- Potential risks to surface water and groundwater resulting from the use and storage of fuels, oils and other potentially polluting substances;
- Potential risks to surface water and groundwater resulting from the pouring or leaching of concrete for the turbine foundation;
- Loss and sterilisation of soils due to the construction of access tracks and turbine footings; and,
- Slight increase in impermeable areas due to foundations, crane pads and access tracks.

7.3.3 Mitigation

The single wind turbine development has been designed to use existing tracks where possible to minimise the amount land take for the development. No watercourse crossings or drain diversions are required for the development.

The site infrastructure is located greater than 50m from watercourses or water features shown on 1:50,000 and 1:25,000 scale OS mapping. The nearest watercourse to the proposed development are two field drains (over 220m from the wind farm infrastructure) draining to River South Esk.

There are no known PWS features on the site or properties that are likely to be on PWS's identified within 250m of the turbine location or 100m from the access track.

The turbine location has been designed to avoid the geological fault shown on geological mapping.

The management of sediment laden runoff and concrete pouring will be main mitigation priorities for this development.

Access Tracks

Tracks will be stone-based and possess a camber to ensure rapid drainage (to avoid ponding and rutting which generates turbid water). Drainage will be collected and directed by strip drains to either infiltration drains or to areas of sufficient vegetation to promote the infiltration of the track runoff. Such measures will be based on the best practice guidelines and will lead to minimal changes on surface water regime.

Any silty water generated on site will ideally be settled out as much as possible through drainage mitigation measures (silt traps etc.) and channelled into vegetated areas at least 20m from any water body to allow the settlement of suspended solids. Silt traps, gravel, sand bags, silt fencing and anchored straw bales may be required at the discharge points in order to prevent erosion at the outlet, alleviate flow and aid in flow dispersion across a wider area of vegetation to prevent potential scour and remobilisation of deposited silt.

Discharge points will be located a sufficient distance from any water body to allow adequate infiltration or settlement of suspended solids to prevent any discharged surface runoff potentially entering the water bodies. Direct discharge to water bodies will not be permitted.

Wind Turbine and Crane Pad

Construction mitigation and enhancement measures detailed below will ensure risks are minimised during the construction of the wind turbine and crane pad.

The turbine foundation will be formed through the pouring of concrete. Without controls on this process, concrete spillages could potentially result in pollutants coming into contact with local groundwater or surface water. Temporary bunds should be placed around pouring operations to contain concrete spillages and a spill response protocol should be developed for use by contractor.

As detailed in the baseline description, the geology underlying has limited local groundwater potential. Prior to concrete pouring in the turbine excavation, the degree of weathering of bedrock should be assessed. It may be necessary to use a protective geotextile liner within the excavation to ensure liquid concrete does not come into contact with underlying strata and shallow groundwater. A geotextile liner would restrict the flow of concrete into the surrounding groundwater. This would only be necessary if there was evidence of significant fracturing and groundwater flow. Given the nature of the geology, it is considered that the likelihood of encountering groundwater is unlikely.

Should shallow groundwater be encountered during construction of the turbine foundation, any dewatering required should be pumped to a small holding sump to allow removal of suspended sediments. Once the solids have been removed, groundwater should either be discharged direct to surrounding vegetation or a small down slope trench allowing infiltration back into the ground. Any discharge should be in agreement with the SEPA and be in accordance with Water Environment (Controlled Activities) Regulations (CAR) 2011 (as amended in 2013). Any untreated discharge should be directed away from water bodies.

A trench (2m wide) down gradient of the turbine could be used to collect and attenuate any overland/surface flow. This will intercept any overland flows, allow some settling out of sediments from the water column and ensure no increased flood risk to the neighbouring or down gradient areas identified.

Site Activities

Good working practices will be adopted throughout the construction works to protect the water environment, ecology and human health. The storage of oil, fuel and other substances will be within a designated area. SEPA's General Binding Rules dictate that oil and fuel will be stored within impervious storage bunds (or double skinned tanks) with 110% capacity of the largest tank or 25% of the total storage capacity, whichever is greater, so that any spillages or leaks are contained. All tanks, whilst designed to provide more storage volume than needed, may be fitted with alarms to warn site workers if the volume exceeds a specified level. Machinery should be routinely checked to ensure they are in good working order and spill kits should be on site in case of a spill.

7.4 Conclusions and Recommendations

The hydrological setting for this single wind turbine development is considered to be of low to medium risk. Hydrologically sensitive receptors to the development include the Melgund Burn and un-named drains to the north being hydrologically connected to the River South Esk SAC approximately 500m downstream of the site. The proposed turbine is located over 300m from the nearest known surface water features down gradient of the infrastructure allowing a suitable distance to manage and mitigate any potential sediment laden waters or pollutants from entering the watercourses including an attenuation trench down gradient of the turbine to minimize in runoff rates down gradient. No private water supply sources or infrastructure are known within 250m of the development area. With the appropriate mitigation undertaken in accordance with best practice guidance the risks to the water and soil environment are considered to be minor and therefore insignificant.



8 Cultural Heritage

8.1 Introduction

This section considers the likely effects on the Historic Environment of the construction, operation and decommissioning of the proposed development and associated infrastructure.

8.2 Methodology

8.2.1 Information Sources

A desktop study was undertaken to identify any features of cultural heritage significance within 5km of the proposed development using Pastmap and the Local Historic Environment Record, historic maps and other relevant sources.

A desktop search was also undertaken for publicly available information in relation to existing or proposed wind farms/turbines within the local area.

8.2.2 Assessment Methods

Significance of effect was determined with respect to the sensitivity of the baseline conditions and the predicted magnitude of effect. As described in detail below, this assessment was undertaken separately for direct effects (e.g. damage or severance) and indirect effects (i.e. changes to cultural heritage setting owing to visual intrusion).

Sites were assigned a level of importance on a scale of 'less than local' to 'international', as shown in Table 8-1. This was established on the basis of statutory designation and/or assessed cultural heritage importance.

Table 8-1: Cultural Heritage Importance

Importance	Site Type
International	World Heritage Sites.
National	Scheduled Monuments. Category A Listed Buildings. Gardens and Designed Landscapes Some undesignated sites assessed as being of national importance.
Regional	Category B Listed Buildings. Battlefield Sites Conservation Areas. Some undesignated sites assessed as being of regional importance.
Local	Category C(s) Listed Buildings Some undesignated sites assessed as being of local importance.
Less than local	Sites either already badly damaged, destroyed or whose historic value is too slight for inclusion in a higher class.

World Heritage Sites are afforded international protection under the UNESCO World Heritage Convention, with Scheduled Monuments nationally protected under the 'Ancient Monuments and Archaeological Areas Act 1979'. The 'Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997' provides for the designation of Category, A, B and C(s) Listed Buildings which are considered to be of national, regional and local importance respectively.

Conservation Areas are assessed as being of Regional importance, and Designed Landscapes are assessed as being of national importance, following discussion with Historic Scotland on previous projects.

Many sites of cultural heritage importance are not currently afforded any statutory protection through designation. For the purposes of assessment, these undesignated sites were assigned a level of importance using professional judgement supported by review of the following guidance:

- criteria used in Scottish Historic Environment Policy (SHEP 23) for the designation of SAMs (Historic Scotland, 2009); and
- non-statutory criteria used in the designation of Listed Building categories (Memorandum of Guidance on Listed Buildings and Conservation Areas; Historic Scotland, 1998 and SHEP 23).

Direct Effects

Direct impacts may be caused by a range of activities during the construction phase of development, including ground disturbing excavations for turbine foundations; crane pads; access tracks; borrow pits; storage and compound areas and cable and service trenches. Direct impacts on cultural heritage features are normally adverse, permanent and irreversible. The significance of predicted direct effects (i.e. physical disturbance) (Table 8-4) was determined taking into account the importance of the archaeological resource affected (Table 8-2), and the magnitude of the effect (Table 8-3).

Table 8-2: Magnitude of Direct Effects on Cultural Heritage Sites

Magnitude	Criteria
Very Severe	Disturbance to over 75% of the known or estimated area of the site
Severe	Disturbance to between 50% and 75% of the known or estimated area
Medium	Disturbance to between 25% and 50% of the known or estimated area of the site
Negligible	Disturbance of up to 25% of the known or estimated area of the site

The assessment of significance of effect was further adjusted as appropriate using professional experience to take into account the relative importance of the specific parts of the site that would be affected. For instance, an effect which is of 'very severe' magnitude in terms of the area of the site affected may nevertheless only affect peripheral features, while a 'medium' magnitude effect may affect the core of a site. Other qualitative factors taken into account include potential severance of linked features, nature of the severed linkage, the amount of stratigraphy which would be disrupted, and the overall effect on the historic integrity of the site.

Table 8-3: Significance of Direct Effects on Cultural Heritage

Magnitude Importance	Very Severe	Severe	Medium	Negligible
National	Substantial	Substantial	Moderate	Slight
Regional	Substantial	Moderate	Slight	Negligible
Local	Moderate	Slight	Slight	Negligible
Less than Local	Slight	Negligible	Negligible	Negligible

Indirect Effects (Setting)

Many archaeological sites are not visible, or barely visible, from ground level. Such sites will not usually be vulnerable to visual effects i.e. effects on setting. However, some invisible or partially visible sites may be located in an area where the immediate topography and landscape is important to an understanding of the site, and consequently the setting and location might be more sensitive.

A selection process was undertaken to identify cultural heritage sites that may receive/have indirect setting effects arising from/as a result of the proposed development. Their sensitivity to indirect visual effects [on their setting] was separately determined according to the definitions in Table 8-5.

Table 8-4: Sensitivity of Cultural Heritage Sites to Effects on Setting

Sensitivity of Receptor	Definition
High	Sites of national importance that are visually prominent and whose setting contributes significantly to their importance; invisible or partially visible sites of national importance whose location and topographical context aid our understanding of their form and function.
Medium	Sites of regional importance that are visually prominent and whose setting contributes significantly to their importance; invisible or partially visible sites of regional importance whose location and topographical context aid our understanding of their form and function.
Low	Sites of local importance whose landscape setting contributes significantly to their importance. Sites of local importance whose landscape setting contributes significantly to their importance.
Negligible	Sites whose landscape setting is of negligible importance

The magnitude of effects on the setting of cultural heritage sites was assessed according to established principles and criteria set out in published guidance (Memorandum of Guidance Historic Scotland 1993, Managing Change in the Historic Environment (Setting) Historic Scotland 2010 and Guidelines for Landscape and Visual Effect Assessment (LI/EMA, 2002). These criteria were also used in the assessment of overall visual effects, and are described in more detail in Section 4 (Landscape and Visual). The application of the criteria leads to a determination of the magnitude of effect for each viewpoint on a four-point scale of 'Dominant', 'Prominent', 'Present' or 'Negligible'. Each viewpoint was selected and identified as the most appropriate location for assessment of inter-visibility. This process was undertaken using the 'best' views to and from the monument allied to its landscape setting and the topography as it relates to the site and any other associated sites in the general landscape. Any inter-visibility with the proposed Development was then assessed from this location.

Effects on setting were assessed using Zone of Theoretical Visibility (ZTV) mapping, and the creation of wireframes to indicate the potential views of the wind turbine. This represents worst-case assessment, as it assumes no intervening ground cover screening such as woodland or other buildings.

As with direct effects, the significance of effects on setting was determined taking into account the importance of the archaeological resource affected, and the magnitude of effect. For each site, the viewpoint taken into consideration was the one with the greatest magnitude of effect. Table 8-5 illustrates the matrix of importance used to determine the significance of effect on setting.

Table 8-5: Determination of Significance of Effects on Setting

Magnitude Sensitivity	Dominant	Prominent	Present	Negligible
High	Substantial	Substantial	Moderate	Slight
Medium	Moderate	Moderate	Slight	Negligible
Low	Slight	Negligible/Slight	Negligible	Negligible

8.3 Assessment Results

There are no direct effects on cultural heritage features based on the findings of the desk-based assessment, with no local or regional features discovered within the site boundary. There may be indirect effects arising from the development where it alters the setting of a feature. According to policy guidance, such effects are normally considered more significant to designated features of national importance, namely Scheduled Ancient Monuments (SAMs), 'A' listed buildings and Gardens and Designed Landscapes (GDLs). A list of the nearest features of national importance within 5km of the Netherton turbine can be seen below.

- SAMs:
 - Broomknowe Enclosure (600m north)
 - Netherton Enclosure (1.3km west)
 - Netherton Settlement (1.5km southwest)
 - Middle Drums Ring Ditches (3.0km east)
 - Melgund Cottage Cairn and Enclosure (3.3km southwest)
 - Balbinny Enclosure (3.4km southwest)
 - Mains of Careston Barrows (3.0km northwest)
 - Craigend of Careston enclosure (2.9km north northwest)
 - Killievair stone standing stone (3.1km north)
 - Broomfield Enclosure (3.3km north northeast)
 - Flemington Tower, Aberlemno (4km southwest)
 - Brechin, Maison Dieu Chapel (4.3km northeast)
 - Aberlemno churchyard, cross slab and symbol stones (4.4km southwest)
 - Brechin Cathedral Round Tower (4.2km northeast)
- 'A' listed buildings:
 - Kintrockat House (1.6km north northeast)
 - Melgund Castle (2.0km southwest)

- Baptist Church and Halls, Panmure street/southesk street (4.7km northeast)
- Gardner memorial church, St Ninian's square and Damacrie road (4.9km northeast)
- Ardovie house (3.6km southeast)
- Maison Dieu Chapel Maison Dieu Lane (4.6km northeast)
- Brechin Bridge over River South Esk off River Street (4.9km east)
- Round Tower at South West Angle of Cathedral church lane (4.4km northeast)
- Stannochy Bridge (2.7km northeast)
- Brechin Cathedral church lane (4.3km northeast)
- Brechin Castle (4.3km northeast)
- 68-74 High Street (4.4km northeast)
- 25-27 High Street (4.4km northeast)
- Careston Castle (3.6km northwest)
- GDLs:
 - Brechin Castle (2.8km northeast)
- Conservation Areas
 - Brechin Town Centre (4.2km northeast)
 - Brechin St Ninian's Square (4.7km northeast)

A review of the SAMs and A-listed buildings within 5km of the site has been completed and the results presented in Table 8-6.

Table 8-6: SAMs and A-listed buildings within 5km of proposed turbine

SAM/A Listed Building	Distance to Turbine	Comments	Significance
Killievair stone, Standing stone, barrelwell smithy	3.1km	Stone on a low ridge with predicted visibility of the turbine. Impacts on the setting of the feature considered to be minimal	Minor
Flemington Tower, Aberlemno	4.0km	Remains of a towerhouse of early seventeenth century. The ZTV shows that the turbine will be visible from this SAM. Indirect effects of a low magnitude of impact are predicted.	Minor
Craigend of Careston Enclosure	2.9km	Remains of an enclosed settlement which lies on a low ridge in arable farmland. ZTV shows the turbine will be visible from this SAM. Indirect effects of a low magnitude of impact are predicted.	Minor
Mains of Careston, barrows	3.0km	Remains of two round barrows of prehistoric date which lie on sloping arable farmland. Screened by woodland to the southeast, impact is considered to be minimal	Negligible
Netherton Enclosure	1.3km	Remains of an enclosed settlement of prehistoric date represented by cropmarks visible on oblique aerial photographs in arable farmland. ZTV's show that the turbine will be	Minor

SAM/A Listed Building	Distance to Turbine	Comments	Significance
Netherton Settlement	1.5km	visible from this SAM. Indirect effects of a low magnitude of impact are predicted. Ancient settlement represented by cropmarks visible on oblique aerial photographs in arable farmland. ZTV's show that the turbine will be visible from this SAM. Indirect effects of a low magnitude of impact are predicted.	Minor
Middle Drums, Ring ditches	3.0km	Remains of two ring ditch houses screened by woodland to the east. Impact is considered to be minimal.	Negligible
Broomfield Enclosure	3.3km	Remains of an enclosed settlement of prehistoric date screened by woodland to the south. Impact is considered to be minimal.	Negligible
Balbinny Enclosure	3.4km	Remains of an enclosed settlement of prehistoric date. ZTV's confirm that the proposed turbine will not be visible from this location.	Negligible
Broomknowe Enclosure	600m	Comprises the remains of an enclosed settlement of prehistoric date represented by cropmarks visible on oblique aerial photographs. ZTV's confirm that the turbine will be visible from the SAM. Indirect effects of a moderate magnitude of impact are predicted due to proximity to the proposed turbine.	Moderate
Melgund Cottage Cairn and Enclosure	3.3km	Remains of a cairn and enclosure of prehistoric date. ZTV's confirm that the proposed turbine will not be visible from this location.	Negligible
Brechin Maison Dieu Chapel	4.3km	Surviving fragment and remainder of the site of the chapel which served Maison Dieu hospital in Brechin. Screened by woodland to the southwest. Impact is considered to be minimal.	Negligible
Aberlemno Churchyard, Cross slab and symbol stones	4.4km	Two symbol stones and a cross slab of Pictish date. ZTV's confirm that the turbine will be visible from the SAM. Indirect effects of a low magnitude of impact are predicted.	Minor
Brechin Cathedral round tower	4.2km	Round tower at the southwest angle of the nave of Brechin Cathedral. Screened by woodland to the southwest. Impact is considered to be minimal.	Negligible
68-74 High Street	4.4km	Building is screened by woodland to the southwest restricting views to the	Negligible

SAM/A Listed Building	Distance to Turbine	Comments	Significance
Kintrockat House	1.6km	turbine. At 4.4km, the impact is considered to be minimal. Building is screened by woodland to the south restricting views to the turbine. At 1.6km, the impact is considered to be minimal.	Minor
Melgund Castle	2.0km	ZTV's show that the turbine will be visible from this Listed building. At 2km, indirect effects of a moderate magnitude of impact are predicted.	Moderate
Baptist Church (formerly West and St Columba's Parish Church) and Halls, Panmure Street/South Esk Street	4.7km	Building is screened by woodland to the southwest restricting views to the turbine. At 4.7km, the impact is considered to be minimal.	Negligible
Gardner Memorial Church, St Ninian's Square and damacre Road including Church Halls and Vestries.	4.9km	Building is screened by woodland to the southwest restricting views to the turbine. At 4.9km, the impact is considered to be minimal.	Negligible
Ardovie House	3.6km	ZTV's show that the turbine will be visible from this Listed building. Indirect effects of a low magnitude of impact are predicted.	Minor
Maison dieu Chapel Maison dieu lane	4.6km	Screened by woodland to the southwest restricting views to the turbine. At 4.6km, the impact is considered to be minimal.	Negligible
Brechin Bridge over River south Esk off River Street.	4.9km	Screened by woodland to the southwest restricting views to the turbine. At 4.9km, the impact is considered to be minimal.	Negligible
Round tower at south west angle of Cathedral Church lane	4.4km	Screened by woodland to the southwest restricting views to the turbine. At 4.4km, the impact is considered to be minimal.	Negligible
Stannochoy Bridge	2.7km	Screened by woodland to the southwest restricting views to the turbine. At 2.7km, the impact is considered to be minimal.	Minor
Brechin Cathedral Church lane.	4.4km	Screened by woodland to the southwest restricting views to the turbine. At 4.4km, the impact is considered to be minimal.	Negligible
Brechin Castle	4.3km	Listed building within a GDL, screened by woodland to the southwest restricting views to the turbine. The impact on the setting of the GDL is considered to be minimal.	Minor
25, 27 High Street	4.4km	Screened by woodland to the southwest restricting views to the turbine. At 4.4km, the impact is considered to be minimal.	Negligible
Careston Castle	3.6km	Screened by woodland to the	Negligible

SAM/A Listed Building	Distance to Turbine	Comments	Significance
Brechin Town Centre	4.2km	southeast restricting views to the turbine. At 3.6km, the impact is considered to be minimal. Conservation area screened by woodland to the southwest. At 4.2km, the impact on the setting is considered to be minimal.	Negligible
Brechin St Ninian's Square	4.7km	Conservation area screened by woodland to the southwest. At 4.7km, the impact on the setting is considered to be minimal.	Negligible

8.4 Conclusion

It is considered that there are no direct effects from the proposed development on archaeological or cultural heritage features. The proposed Netherton turbine will be 600m from the nearest national designation for cultural heritage with the majority of the designations screened from the proposed turbine by topography and woodlands. It is considered that any impacts on the settings of majority of these designated features will be of minor significance. Impacts on the setting of Melgund Castle and Broomknowe Enclosure are considered to be moderate as a result of proximity to the proposed turbine and direct views.

9 Shadow Flicker

9.1 Introduction

The web based guidance which supersedes PAN 45 only provides limited advice on shadow flicker stating that “shadow flicker can only occur within buildings where the flicker effects appear through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the potential site” and further that “the effect diminished with distance and that flicker effects are likely only to occur within ten rotor diameters of a turbine” (Scottish Government, 2011).

A recent report by consultants Parson’s Brinkerhoff for the Department of Energy and Climate Change (DECC, 2011) reviewed the UK evidence base on shadow flicker by carrying out a review of international guidance, literature review and investigation of current assessment methodologies employed by developers. This report concluded that the assumption of ten rotor diameters as a suitable area for investigation and 130 degrees either side of north was acceptable. Furthermore the study concluded that there is a need to address ‘worst-case’ and what is realistic in shadow flicker assessments.

Planning for Renewable Energy: A Companion Guide to PPS 22 (2004) considers the issue of shadow flicker in paragraphs 73-78, the key points are:

- Shadows may be cast from wind turbines over neighbouring properties under certain conditions as the sun may pass behind the rotors of a wind turbine;
- When the blades rotate, the shadow flicks on and off; the effect is known as ‘shadow flicker’;
- Shadow flicker only occurs inside buildings where the flicker appears through a narrow window opening;
- It can be calculated from the geometry of the machine and the latitude of the site and the likelihood of it happening depends upon a number of factors such as the time of year; cloud cover and prevailing wind direction;
- Only properties within 130 degrees either side of north, relative to the turbines in the UK can be affected;
- The further the observer is from the turbine the less pronounced the effect will be; and
- Flicker effects have been proven to occur only within ten rotor diameters of a turbine.

There is no national planning policy or guidance in Scotland which deals with ‘exposure’ to shadow flicker effects in terms of acceptable periods for duration. There is, however, guidance in Northern Ireland which recommends that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day (DOENI 2009). This is based on research by Predac, a European Union sponsored organisation promoting best practice in energy use and supply which draws on experience from Belgium, Denmark, France, the Netherlands and Germany.

9.2 Assessment Methodology

A shadow flicker assessment has been undertaken for the proposed development. The potential effects of shadow flicker were modelled using WindFarmer software (v5.2.11.0 Garrad Hassan). The software creates a mathematical model of the development and its surroundings based on:

- Turbine locations, hub height and rotor diameter;
- Topography based on Ordnance Survey 50m DIM data; and
- Latitude and longitude of the development (used in calculating the position of the sun in relation to time of day and year).

The calculation is run for a worst-case scenario which includes the following assumptions:

- Weather conditions are such that shadows are cast during every day of the year, i.e. bright sunshine every day;
- The turbine rotor will always be facing directly towards a given window, maximising the size of the shadow and hence frequency and duration of the effect;
- The turbine are always rotating; and
- There will not be intervening structures or vegetation (other than topography) that may restrict the visibility of a turbine, preventing or reducing the effect.

When the factors above are accounted for, the likely actual incidence of shadow flicker will be substantially less than that predicted based on the worst-case scenario.

9.3 Assessment Results

Of the surrounding residential dwellings, a property at Balnacake (NGR 355787, 757443) lies within 10 rotor diameters (maximum of 540m for the turbine size under consideration) and within the potential area of shadow casting from the turbine (130 degrees either side of north).

The shadow flicker model has predicted that shadow flicker could occur at this property based on the worst case conditions and taking no account of weather conditions or the orientation of turbine and property windows.

The shadow flicker model predicts shadow flicker occurrence as shown in Table 9-1 below.

Table 9-1: Shadow Flicker results

Receptor	Maximum Days per year	Maximum hours per year	Maximum Minutes per day	Period likely to Occur	Theoretical Occurrence Period
Balnacake	44	14	26	29/04-20/05 24/07-14/08	04:56-05:22 05:07-05:30

Assuming worst case scenario, no more than 30 minutes of shadow flicker would be experienced in any one day at the Balnacake property.

9.4 Mitigation

It has been demonstrated that shadow flicker is theoretically capable of occurring at one neighbouring residential property. This theoretical potential does not take into

account a number of property specific factors that can preclude shadow flicker from occurring mainly whether the property has windows facing the development site and whether the effects may be screened by trees or buildings. There is, therefore, no certainty that shadow flicker will occur in practise or that, if it does occur, it will give an unacceptable effect on amenity.

Any incidence of shadow flicker can be completely avoided by programming the wind turbine to shut down at appropriate time of the day/year. This has been proven to provide complete avoidance of the issue at a number of operational sites across the UK (DECC 2011).

Alternatively other forms of mitigation including blinds and vegetation planting for screening purposes can be agreed with the potentially affected residents.

9.5 Summary

Based on an initial assessment of the properties surrounding the development it is considered that there will be significant effects associated with shadow flicker at Bainacake property. These effects do not exceed the guidance limits and are modelled on a worst case scenario basis. In the event that Shadow Flicker does occur, mitigation will be put in place to avoid any adverse impacts of shadow flicker on the property.



10 Aviation, Radar and MOD

10.1 Aviation and Radar

Wind turbines have the ability to reflect radio waves and, therefore, have the potential to interfere with radar systems. Reflections from the rotating wind turbine blades may show up on radar as 'clutter'. Wind turbines can also reflect away some of the emitted radar signal and the 'echo' from aircraft in a line of sight from the radar, beyond the turbines. Such effects could have an adverse impact on aircraft safety.

The site lies outside the official 17km consultation zone for the closest civil aviation aerodrome, which is Dundee Airport. The Dundee airport has no radar facilities and no issues are anticipated.

The British Aviation Authority (BAA), the Civil Aviation Authority (CAA) and National Air Traffic Systems (NATS) no longer comment on proposals during the pre-application process however a proforma has been filled and sent to them.

10.2 Ministry of Defence (MOD)

The proposed site lies approximately 34km north of the nearest MOD infrastructure, RAF Leuchars radar. At this distance, the proposed turbine is not predicted to have an impact on MOD operations.



11 Television and Communication Links

11.1 Television Reception

Wind turbines have the potential to adversely affect domestic television reception through either physical blocking of the transmitted signal or, more commonly, by introducing multi-path interference where some of the signal is reflected through different routes. Multi path interference to television signals can cause 'ghosting' on older analogue transmissions where an object in the picture appear several times in different positions. This effect rarely extends beyond 2km from a turbine between the receiver and transmitter.

There are however a number of measures that can be taken to reduce or overcome any interference effects including:

- The provision of a more sensitive receiver antenna for affected households;
- Re-positioning of the antennae to receive signals from a different transmitter;
- Installation of a local community re-broadcast facility; and
- An alternative means of transmission, such as a satellite or cable.

The proposed development is located in area which has been served by a digital transmitter and, therefore, is unlikely to be affected by the development of the wind turbine as digital signals are rarely affected. In the unlikely event that television signals are proven to be affected by the proposed development, the mitigation measures discussed above will be considered by the applicant.

11.2 Telecommunications

The moving rotors of wind turbines have the potential to impact on telecommunication signals by causing Electromagnetic Interference (EMI). Wind turbines cause EMI by reflection of signals from rotor blades so that a nearby receiver picks up both a direct and reflected signal. The types of civilian and military communication signals which may be affected by EMI include TV and radio broadcasting, microwave and cellular radio communications and various navigational and air traffic control systems. A turbine located within, or near to, the communication link may interfere with the signal causing unwanted 'noise'.

Consultations were undertaken with Ofcom, Joint Radio Company (JRC) and Atkins.

Ofcom identified one link operator (Ericsson) within 1.5km of the proposed site. Consultations were made with "Ericsson" on 28/10/13 with a follow up mail sent on 19/02/14 and a "no objection" response was received on 21/02/14.

JRC objected to the proposed development on 30/08/13 and after further consultation with them and site design to take the identified links into account, a "no objection" response was received from JRC on 23/01/14.

Information on the nearby EMI links can be found in Table 11-1.

Table 11-1: EMI Link details

Link Operator	Start point station name	Start point co-ordinates	End point station name	End point co-ordinates	Path Length
JRC	Dunnichen Hill	NGR 350800, 749700	Edzell SS	NGR 363500, 770500	24,303m
JRC	Dunnichen Hill	NGR 350800, 749700	Inchbare Pri	NGR 360600,765300	18,377m
Ericsson	Finnavon	NGR 350170, 757515	MCL Brechin	NGR 358830, 757915	8.6km

Based on the consultations undertaken and the information available, it is considered that the proposed development will have no adverse effects in relation to television and communication links.

12 Transport and Access

12.1 Baseline

12.1.1 Access Route to Site

The potential route to site was assessed through desk based assessment by Atmos. The route via the A90, A932 and B9134 was deemed to be the most suitable route due to knowledge of similar loads using this trunk road and the suitability of the roads to accommodate the associated loads.

12.1.2 Preferred Landing Port for Abnormal Loads

The Port of Dundee has been identified as a suitable landing port for turbine components.

12.1.3 Proposed Route for HGVs to Access Site

Deliveries of concrete and aggregate will constitute the majority of the HGV loads generated. The nearest suitable quarry will be selected to supply the materials to ensure travel times are kept as low as reasonably possible.

12.1.4 Upgrades to the Public Road System

A suitable site entrance will be constructed off the B9134 to allow safe access onto site. It is not predicted that any additional upgrades to the public road system will be required but this will be confirmed once a specialist haulier has been appointed.

12.1.5 On Site Access

The technical specification of onsite tracks will be finalised in accordance with the selected turbine manufacturer. A total of approximately 703m of upgraded access track and 520m of new access track are required from the site entrance at NGR 355142, 757792 off the B9134 road to the wind turbine location.

12.2 Construction Impacts

12.2.1 Abnormal Loads during Construction

The vehicles used to transport turbine components would constitute abnormal loads only on the delivery phase of the journey since the extendible trailers are retracted to the size of a standard articulated vehicle (16.5m) during the return leg.

12.2.2 Potential HGV Loads during Construction

HGV traffic is typically slow moving and can, therefore, cause delays to normal traffic movements particularly on smaller roads.

It can be difficult to ascertain the maximum number of vehicles per day during the construction period as different activities may be scheduled concurrently while most activities must happen in sequence. Typically HGV movements are at their highest

when concrete foundations are being poured as there is a requirement for a continuous pouring operation. As it is proposed to import concrete in ready-mix trucks, deliveries will have to be near continuous over a single day to complete the concrete pour.

Concrete and aggregate deliveries will come from a suitably identified quarry located as close to the site as reasonably possible so travel times and therefore disruption times will be kept to a minimum.

12.3 Summary

The construction of the proposed turbine would result in a small temporary increase in traffic levels on the proposed access routes.

A suitable route for transporting abnormal loads, such as turbine components involves the use of the A90, A932 and B9134.

Abnormal loads would be scheduled to occur during off-peak periods, at a time to be agreed with relevant bodies in order to minimise delays to other road users.

With the implementation of mitigation measures such as suitable liaison with relevant transport authorities, the residual traffic and transport effects on the road network will be minimal.

13 Public Access and Recreation

13.1 Health and Safety

A number of health and safety considerations have been taken into account during the environmental assessment process and design of the proposed development. These include:

- Public roads;
- Overhead power lines;
- General turbine safety;
- Rights of way;
- Extreme weather such as lightning and ice throw;
- Public safety and access; and
- Health and safety during construction.

13.1.1 Public Roads

The proposed turbine is located approximately 336m south of the B9134. At this distance no safety concerns are predicted.

13.1.2 Overhead Power Lines

There are no power lines in close proximity to the turbine location and no issues are expected. The nearest transmission power line is approximately 920m northwest of the proposed turbine location.

13.1.3 General Turbine Safety

Wind energy projects have a proven track record of safety. A small number of wind turbines have been known to lose parts of the rotor assembly through accidental damage due to lightning, mechanical failure or extreme gale force winds. However, no member of the public has ever been injured during the normal operation of a wind turbine (Renewable UK, 2010c).

The safe operation of turbines is ensured through a combination of design, quality control and manufacture to high safety standards. The developer will require that the selected wind turbine model will have certification from an internationally recognised authority and have a proven track record of safe operation. The wind turbine installed at the site will comply with BS EN 61400-1: 'Wind turbine generator systems - safety requirements'.

It is not anticipated that there will be much on-site activity once the wind turbine is fully installed and operational. The primary safety systems at the site will include a computerised central control system housed within the substation building. This system will continually monitor the operational status and safe working of key components for the turbine and will allow the operator to remotely monitor the turbine via a modem. Any problems that cannot be resolved by the internal computer will be referred to the operator via the computer's modem link and addressed as soon as possible.

13.1.4 Right of Way/Core Paths

There are no rights of way or core paths in the close proximity of the site.

13.1.5 Extreme Weather

Lightning Strike

Wind turbines can be susceptible to lightning strike due to their height and appropriate measures are taken into account in the design of turbines to conduct lightning strikes down to earth and minimise the risk of damage to turbines. Occasionally however, lightning can strike and damage a wind turbine blade. Modern wind turbine blades are manufactured from a glass-fibre or wood-epoxy composite in a mould, such that the reinforcement runs predominantly along the length of the blade. This means that blades will usually stay attached to the turbine if damaged by lightning and in all cases turbines will automatically shut down if damaged by lightning.

Ice Throw

Ice build-up on blade surfaces occurs in cold weather conditions. Wind turbines can continue to operate with a very thin accumulation of snow or ice, but will shut down automatically as soon as there is a sufficient build up to cause aerodynamic or physical imbalance of the rotor assembly. Potential icing conditions affecting turbines can be expected 2-7 days per year (light icing) in Scotland (WECO, 1999).

The potential for ice throw to occur after start up following a turbine shut down during conditions suitable for ice formation is high. There are monitoring systems and protocols in place to ensure that turbines that have been stationary during icing conditions are restarted in a controlled manner to ensure public safety. The risk to public safety is considered to be very low due to the few likely occurrences of these conditions along with the particular circumstances that can cause ice throw. Despite the recent winters of 2009/2010 and 2010/2011 being unusually icy, there were no recorded incidences of ice throw injury to the public or the operational staff at any wind turbine site in UK.

13.1.6 Public Safety and Access

The Renewable UK Health and Safety Guidelines state that "it is the responsibility of wind farm designers to ensure that the wind turbines and associated equipment are designed to avoid or, where this is not entirely possible, to minimise risks to health and safety whilst they are being assembled, constructed, installed, operated, maintained and decommissioned" (Renewable UK, 2010a). The guidance stipulates the need to ensure potential risks to non-industry personnel i.e. members of the public, are addressed throughout the life phases of projects and that residual risks are acceptable when compared with people's expectations of day to day risk exposure (Renewable UK, 2010a).

Site security and access during the construction period will be governed under Health and Safety at Work Act 1974 and associated legislation. There will be no public access to the site during construction. Once the construction period and commissioning of the wind farm is complete, no special restriction on access is proposed.

The site is not identified as an area used for formal recreation. However, the Land Reform (Scotland) Act (2003) which came into effect in February 2005 establishes

statutory rights of responsible access on and over most land. The legislation offers a general framework of responsible conduct for both those exercising rights of access and for landowners. Informal recreational access would benefit from the presence of the turbine within the site by providing a feature of interest.

Appropriate warning signs will be installed concerning restricted areas such as transformers, switchgear and metering systems. All on site electrical cables will be buried underground with relevant signage.

13.1.7 Health and Safety during Construction

A number of activities outlined in Chapter 2, during the construction phase of the project have potential to injure workers and members of the public. All site work will comply with the following relevant regulations:

- The construction (Design and Management) Regulations 2007 approved code of practice;
- The Health and Safety and Work Act 1974;
- The Management of Health and Safety at Work Regulations 1999;
- Provision and Use of Work Equipment Regulations 1998;
- The Works at Heights Regulations 2005; and
- Control of substances hazardous to Health 1999.

The essence of this legislation is to ensure the safe operation of the construction site and the health and safety of all employees, contractors, visitors, self-employed people and members of the public who may have access to the site. Construction activities will also take account of the Renewable UK Guidelines for Health & Safety in the Wind Energy Industry Sector (Renewable UK, 2010a) and the Management of Health and Safety at work Regulations 1999.

Renewable UK has also produced the Wind Turbine Safety Rules (WTSR) which clearly specifies actions and procedures which have to be followed in order that persons working on wind turbines are safeguarded from inherent dangers that exist from the installed electrical and mechanical equipment in wind turbines (Renewable UK, 2010b). All construction activities and other site works will comply with these rules.

A construction Health and Safety Plan will be developed to manage safety during construction.

When not in use, potentially hazardous machinery will be stored in the secure construction compound to prevent use by unauthorised persons. Normal site safety procedures will be strictly enforced including displaying the appropriate signage concerning restricted areas.

13.2 Other Infrastructure

13.2.1 National Grid Gas Pipeline

A linesearch has been carried out and there are no national Grid pipelines in proximity to the proposed turbine that can be affected by the development.

13.3 Summary

The proposed site is a working farm with limited public access which is unlikely to change during the operational life of the wind turbine.

The safe operation of the turbine is ensured through a combination of design, quality control and manufacture to high standards. The developer will require that the selected wind turbine model will have certification from an internationally recognised authority and have a proven track record of safe operation. The wind turbine installed at the site will comply with BS EN 61400-1; 2005 'Wind Turbines. Design requirements'.

A construction Health and Safety Plan will be developed to manage safety during construction. This will help ensure that health and safety will be of the highest standard.