

Appendix 11-1 - Special Aeronautical Study



V 1.0



Special Aeronautical Study
Cloghercor Wind Farm
Co. Donegal
Ireland



Cloghercor Wind Farm Special aeronautical study

0. Document Information

Document title	Cloghercor Wind Farm Special aeronautical study
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0.1 *Copyright Statement*

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0.2 *Document versions*

Version No.	Pages affected	Date
ASAP internal		
0.1	All	30.10.2022
Customer		
1.0	All	30.10.2022

0.3 *Document version trail*

Version 0.1	Name	Date
Assessment done by procedure designer	Gabriella Laki	27.10.2022
Check and final sign-off by senior procedure designer*	Ian Whitworth	30.10.2022

* By this sign-off, the Senior Procedure Designer confirms that a full verification of the correctness (to the best of his/her knowledge) of the contents of this Special aeronautical study has been carried out and conforms to the latest version of ICAO Doc 8168 (Aircraft Operations) Volume II.

0.4 *Procedure designer concerns*

I Gabriella Laki have no specific concerns and consider that all safety issues concerning the proposed Cloghercor Wind Farm are covered in this document.

0.5 Abbreviations used

A/C.	Aircraft
Alt.	Altitude
Alt. Req.	Altitude Required
ARP	Aerodrome Reference Point
ATT	Along-track tolerance
AMSL	Above Mean Sea Level
Cat.	Category
Cont.	Controlling
Diff.	Difference
Dist.	Distance
Eq. Alt.	Equivalent Altitude
ETP	Earliest Turning Point
FAF	Final Approach Fix
FAP	Final Approach Point
FAS	Final Approach Segment
FAWP	Final Approach Waypoint
FHP	Fictitious Heliport Point
HL	Height Loss
HRP	Heliport Reference Point
IAS	Indicated Air Speed
IAWP	Initial Approach Waypoint
IFR	Instrument flight rules

Int. Seg.	Intermediate Segment
ISA	International Standard Atmosphere
IWP	Intermediate Approach Waypoint
MAPt	Missed Approach Point
MACG	Missed approach climb gradient
MOCA	Minimum obstacle clearance altitude
MRVA	Minimum Radar Vectoring Altitude
OAS	Obstacle Assessment Surface
OCA	Obstacle clearance altitude
PAPI	Precision Approach Path Indicator
Pub.	Published
Req.	Required
RDH	Reference Datum Height
RWY	Runway
SOC	Start of Climb
Surf.	Surface
TAA	Terminal Arrival Altitude
TAS	True Air Speed
THR	Threshold
VFR	Visual flight rules
VPA	Vertical Path Angle
XTT	Cross-track tolerance

0.5.1 Obstacle assessment tables and abbreviations

- **Obstacle data:**

ID	Latitude	Longitude	Alt.	VT

- **I**Dentification, **P**osition, **A**ltitude and **V**ertical **T**olerance

- **Assessment parameters:**

Area	Dist. in	Do	Dz	Dr	DCA	HL	MOC

- Obstacle protection **A**rea (primary [**P**], secondary [**S**] or buffer [**B**]).
- **D**istance from the **i**nnner edge of the secondary area.
- **D**istance to **o**bstacle (Do/Dz/Dr).
- **D**istance to **C**limb **A**ltitude
- **H**eight **L**oss applied.
- **M**inimum **O**bstacle **C**learance applied.

- **Calculated values:**

Surf. alt.	Diff.	Ac. alt.	Alt. req.

- Obstacle protection **S**urface **a**ltitude at position.
- **D**ifference between obstacle altitude and surface altitude.
- **A**ircraft **a**ltitude at obstacle position.
- **A**ltitude **r**equired to clear obstacle.

- **Results:**

OCA	MACG (%)	PDG (%)	Cont.	Close-in	Disreg.

- Minimum **O**bstacle **C**learance **A**ltitude.
- **MACG**.
- **P**rocedure **D**esign **G**radient
- **C**ontrolling obstacle or **N**ot.
- Considered **C**lose-**i**n obstacle or **N**ot.
- Obstacle can be **D**isregarded in the visual segment.



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Cloghercor Wind Farm Special aeronautical study



1. General

This document details the Special aeronautical study that was done concerning the impact of the proposed Cloghercor Wind Farm on the flight procedures at Donegal airport (EIDL), Ireland.

1.1 Geodesic datum

WGS-84, which was established as the working datum.

Reference Latitude	N 00° 00' 00"	Semi Major Axis	6378137 m
Reference Longitude	W 009° 00' 00"	Eccentricity	0.0818191908426215
False Easting	500000	Scaling Factor	0.9996
False Northing	0	Projection Type	Transverse Mercator

1.2 Altitude units

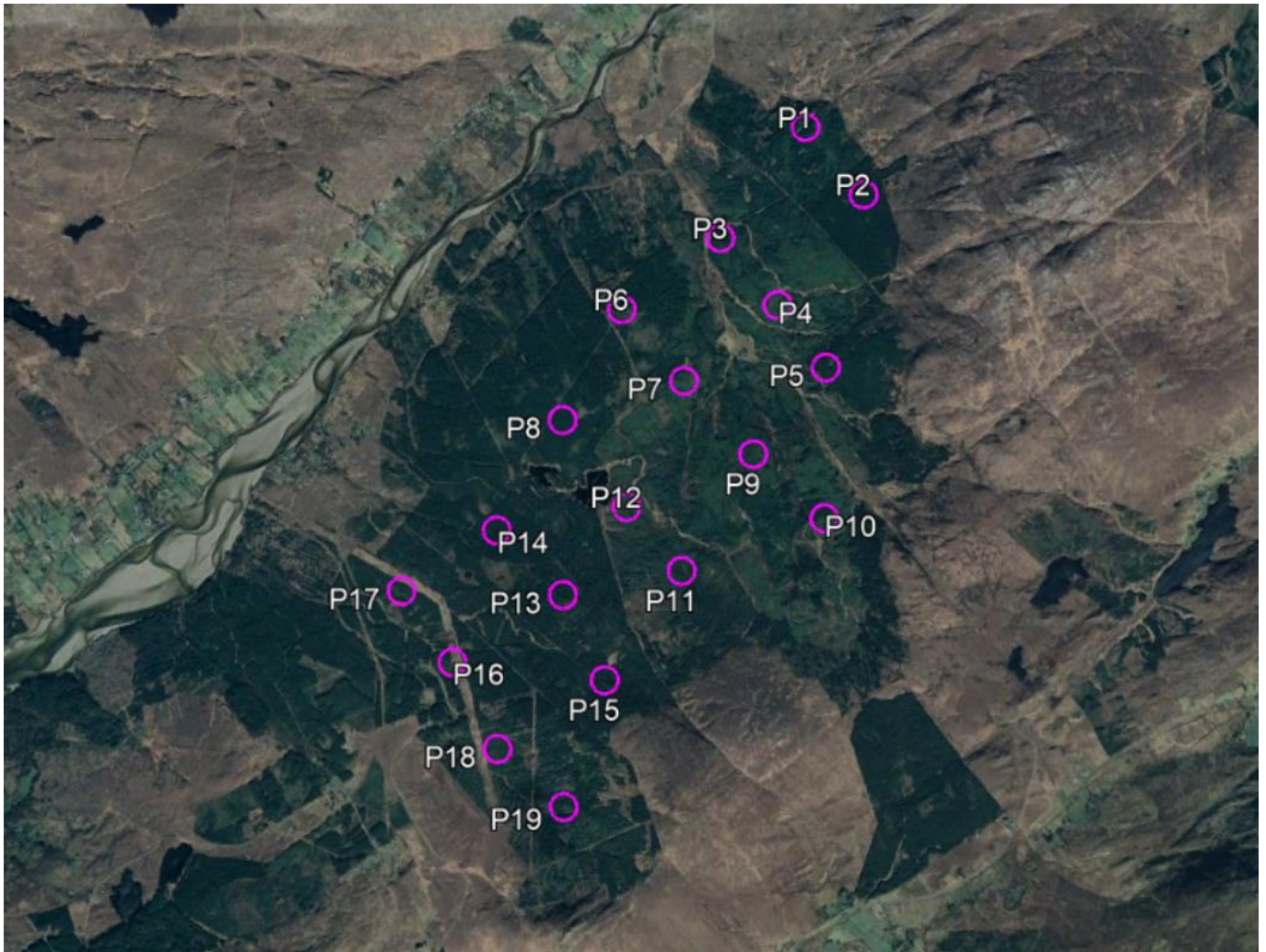
All altitudes and heights used in this study are in metres and all bearings are magnetic unless specified otherwise.

1.3 AIP data

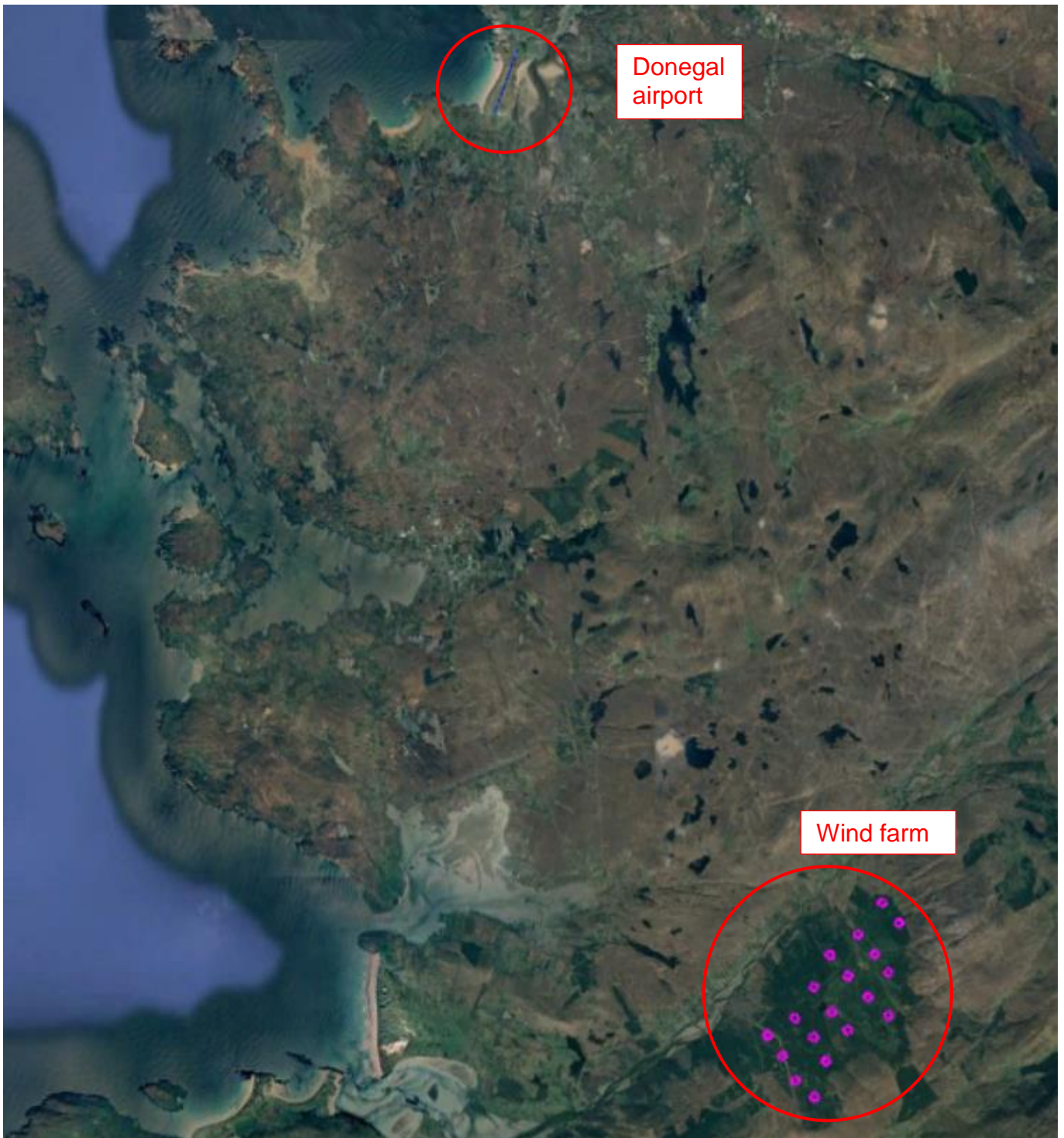
Aeronautical information for Donegal airport was extracted from the Ireland AIP (06 OCT 22) and used in this study.

1.4 Proposed position and altitude

ID	Latitude	Longitude	Base Elevation	Blade length	Height to tip	Actual tip elevation
P1	54.8849654	-8.2142554	48.54	82	200	248.54
P2	54.8811251	-8.2087809	115.16	82	200	315.16
P3	54.8788387	-8.2224301	49.25	82	200	249.25
P4	54.875095	-8.2169649	101.21	82	200	301.21
P5	54.871622	-8.2124054	142.04	82	200	342.04
P6	54.874875	-8.2318875	98.07	82	200	298.07
P7	54.8709294	-8.2259246	100.91	82	200	300.91
P8	54.8687754	-8.2375006	108	82	200	308
P9	54.8668757	-8.2193261	167.6	82	200	367.6
P10	54.8633711	-8.2125800	164.38	82	200	364.38
P11	54.8605015	-8.2261115	166.5	82	200	366.5
P12	54.8639913	-8.2313972	103.13	82	200	303.13
P13	54.8591752	-8.2374553	131.83	82	200	331.83
P14	54.8627167	-8.2438006	91.61	82	200	291.61
P15	54.8545332	-8.2334342	157.4	82	200	357.4
P16	54.8554719	-8.2480304	102.67	82	200	302.67
P17	54.8593841	-8.2529358	89.19	82	200	289.19
P18	54.8507548	-8.2436444	128.12	82	200	328.12
P19	54.8476141	-8.2373155	153.63	82	200	353.63



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2. ICAO Annex 14 / EASA 139 OLS assessment

The purpose of the ICAO Annex 14 surfaces is to define the volume of airspace that should ideally be kept free from obstacles to minimize the danger presented to an aircraft departing from or arriving at an airport.

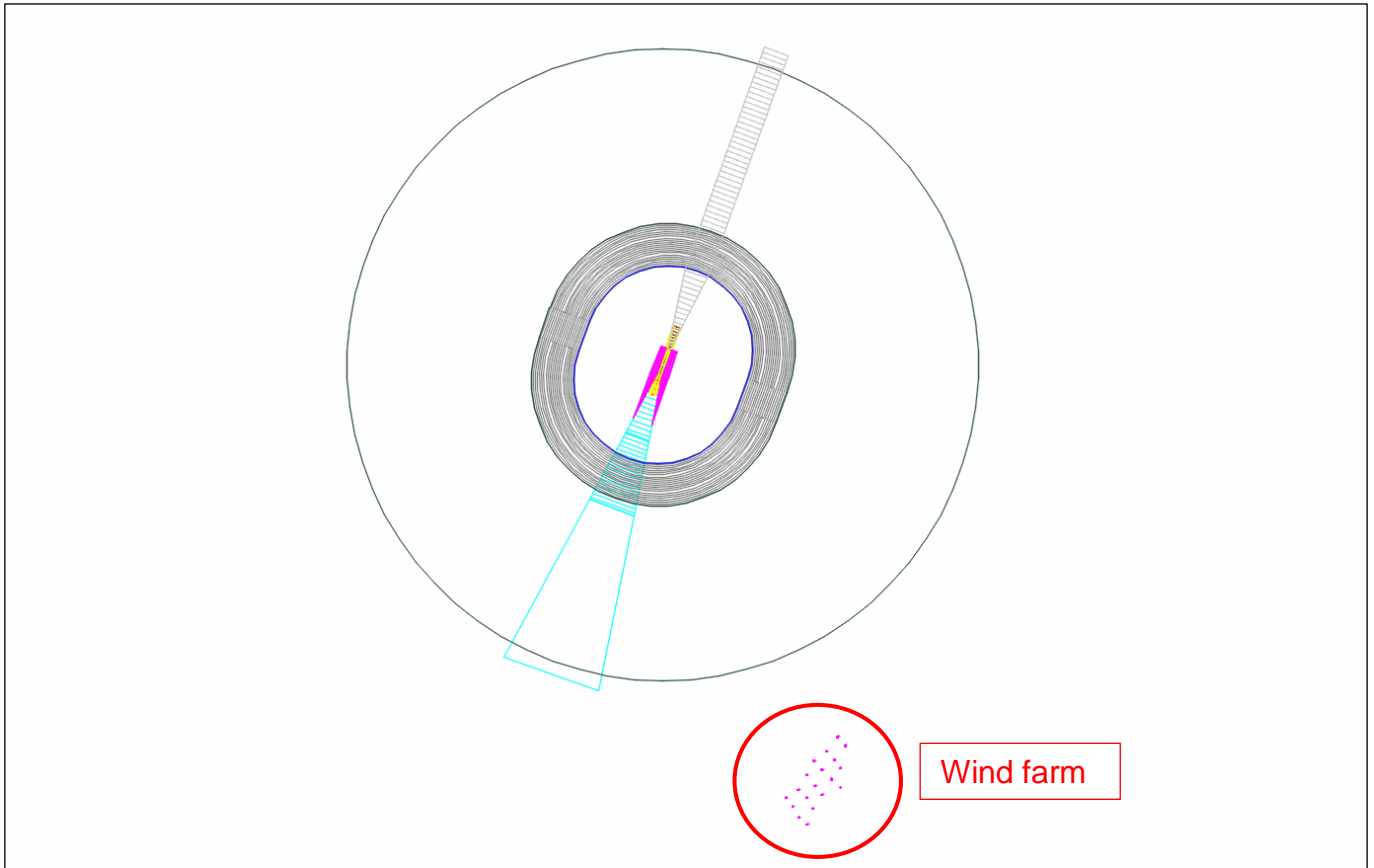
Note: The current approach procedures at Donegal airport are non-precision and as such non-precision criteria should be used. However ASAP has designed precision approaches that will be implemented in the future and so the more restrictive "Precision approach" criteria was used.

2.1 Runway 03

The ICAO Annex 14 surfaces for runway 03 were constructed using the following parameters:

Runway	
Name	RWY03
Code	3
START	
Latitude	55°02'16.41"N
Longitude	008°20'42.28"W
Altitude	2.99 m (9.8 ft)
THR	
Latitude	55°02'22.76"N
Longitude	008°20'38.17"W
Altitude	2.99 m (9.8 ft)
END	
Latitude	55°03'01.77"N
Longitude	008°20'12.91"W
Altitude	9.45 m (31 ft)
Aerodrome Reference Point (ARP)	
ID	ARP
Latitude	55°02'39.00"N
Longitude	008°20'28.00"W
Altitude	9.45 m (31 ft)
Code Letter 'F'	No
Parameters	
Approach Type	Precision
Dep. Track Change > 15°	No
Criteria	
Name	ANNEX 14
Standard	Yes
Approach Surface	
Length Inner Edge	280 m
Distance RWY THR	60 m
Divergence	15 %
1st Length	3000 m
1st Slope	2 %
2nd Length	3600 m
2nd Slope	2.5 %

Horiz. Length	8400 m
Total Length	15000 m
Balked Landing Surface	
Length Inner Edge	120 m
Distance From RWY THR	1800
Divergence	10 %
Slope	3.33 %
Conical Surface	
Slope	5 %
Height	100 m
Inner Approach Surface	
Width	120 m
Distance From RWY THR	60 m
Length	900 m
Slope	2 %
Inner Horizontal Surface	
Height	45 m
Radius	4000 m
Inner Transitional Surface	
Slope	33.3 %
Outer Horizontal Surface	
Height	150 m
Radius	15000 m
Strip Surface	
Semi-width	140 m
Length	60 m
Take-off Surface	
Length Inner Edge	180 m
Distance RWY END	CWY
Divergence	12.5 %
Final Width	1200 m
Length	15000 m
Slope	2 %
Transitional Surface	
Slope	14.3 %



As can be seen in the previous diagram, the Annex 14 surfaces are not penetrated by the Cloghercor Wind Farm.



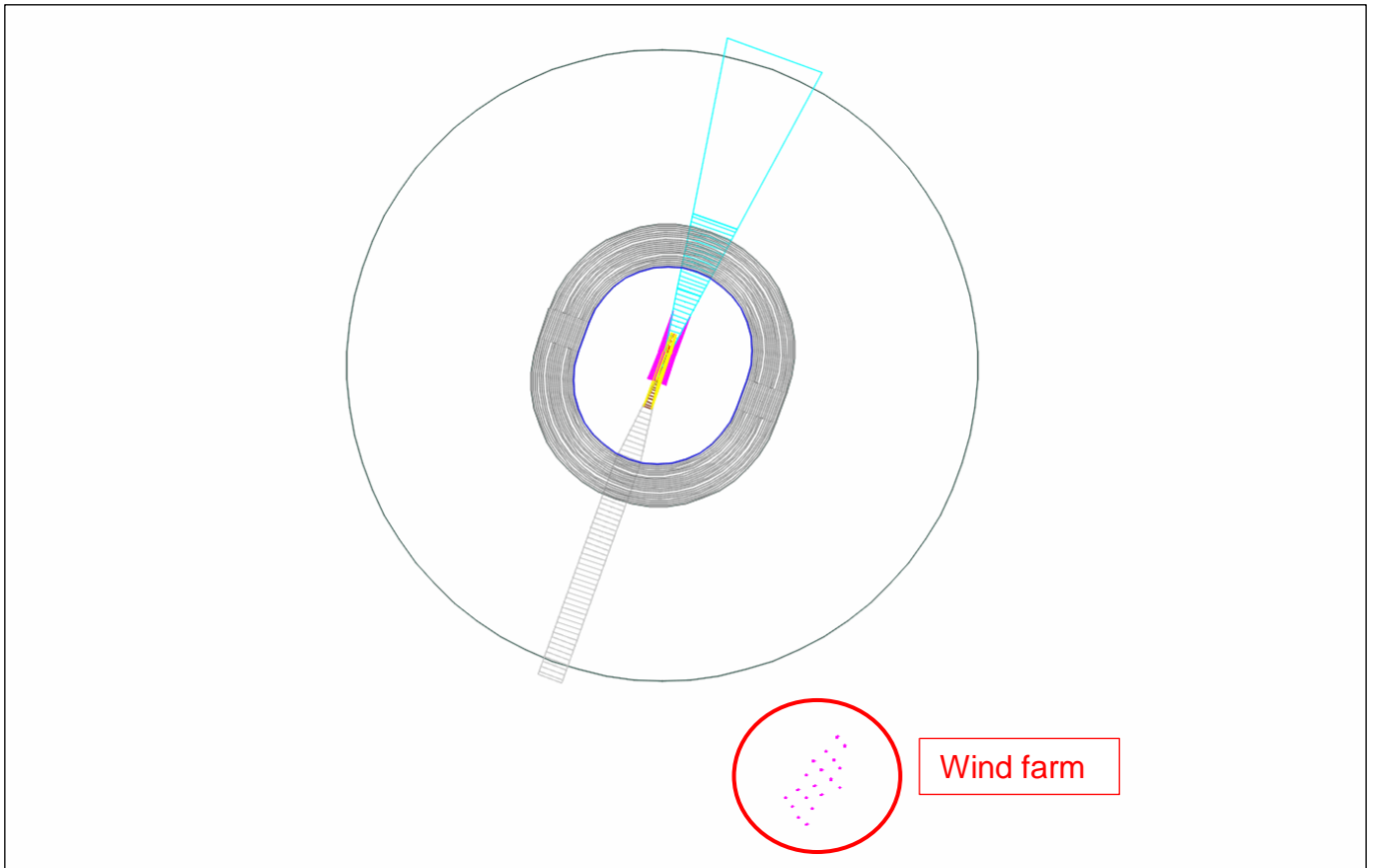
Cloghercor Wind Farm Special aeronautical study

2.2 Runway 21

The ICAO Annex 14 surfaces for runway 21 were constructed using the following parameters:

Runway	
Name	RWY21
Code	3
START	
Latitude	55°03'01.77"N
Longitude	008°20'12.91"W
Altitude	9.45 m (31 ft)
THR	
Latitude	55°02'57.86"N
Longitude	008°20'15.45"W
Altitude	9.45 m (31 ft)
END	
Latitude	55°02'16.41"N
Longitude	008°20'42.28"W
Altitude	2.99 m (9.8 ft)
Aerodrome	
Datum Elevation	THR
Aerodrome Reference Point (ARP)	
ID	ARP
Latitude	55°02'39.00"N
Longitude	008°20'28.00"W
Altitude	9.45 m (31 ft)
Code Letter 'F'	No
Parameters	
Approach Type	Precision
Dep. Track Change > 15°	No
Criteria	
Name	ANNEX 14
Standard	Yes
Approach Surface	
Length Inner Edge	280 m
Distance RWY THR	60 m
Divergence	15 %
1st Length	3000 m
1st Slope	2 %
2nd Length	3600 m

2nd Slope	2.5 %
Horiz. Length	8400 m
Total Length	15000 m
Balked Landing Surface	
Length Inner Edge	120 m
Distance RWY THR	1800
Divergence	10 %
Slope	3.33 %
Conical Surface	
Slope	5 %
Height	100 m
Inner Approach Surface	
Width	120 m
Distance From RWY THR	60 m
Length	900 m
Slope	2 %
Inner Horizontal Surface	
Height	45 m
Radius	4000 m
Inner Transitional Surface	
Slope	33.3 %
Outer Horizontal Surface	
Height	150 m
Radius	15000 m
Strip Surface	
Semi-width	140 m
Length	60 m
Take-off Surface	
Length Inner Edge	180 m
Distance RWY END	CWY
Divergence	12.5 %
Final Width	1200 m
Length	15000 m
Slope	2 %
Transitional Surface	
Slope	14.3 %



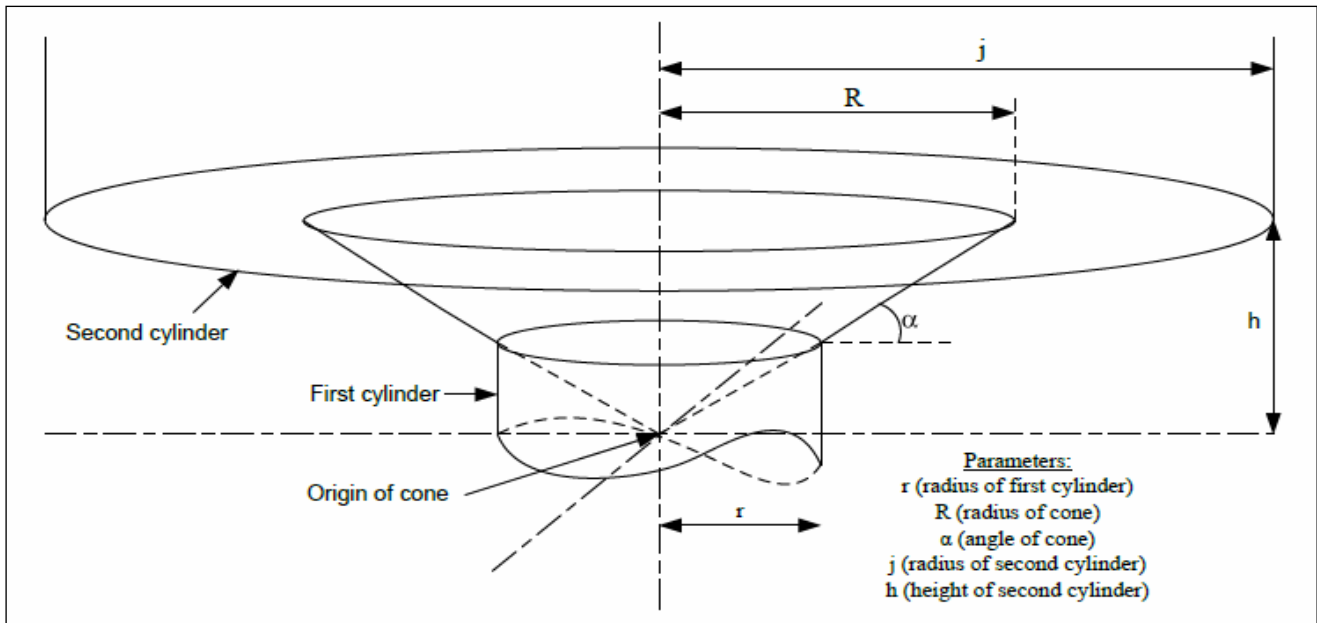
As can be seen in the previous diagram, the Annex 14 surfaces are not penetrated by the Cloghercor Wind Farm.

3. Navigational Aid Shielding

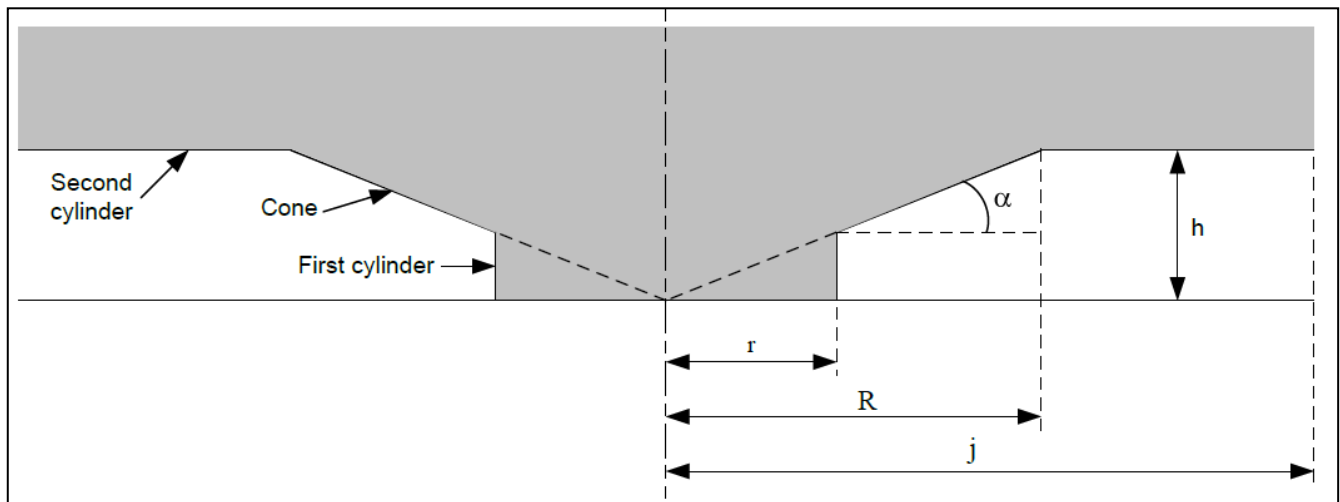
This section is according the ICAO EUR Document 015 European Guidance Material on Managing Building Restricted Areas.

3.1 Shielding for omni-directional facilities

The Shielding volume for omni-directional facilities is defined as follows:



**European guidance material on managing Building Restricted Areas, Figure 2.1: three dimensional representation*

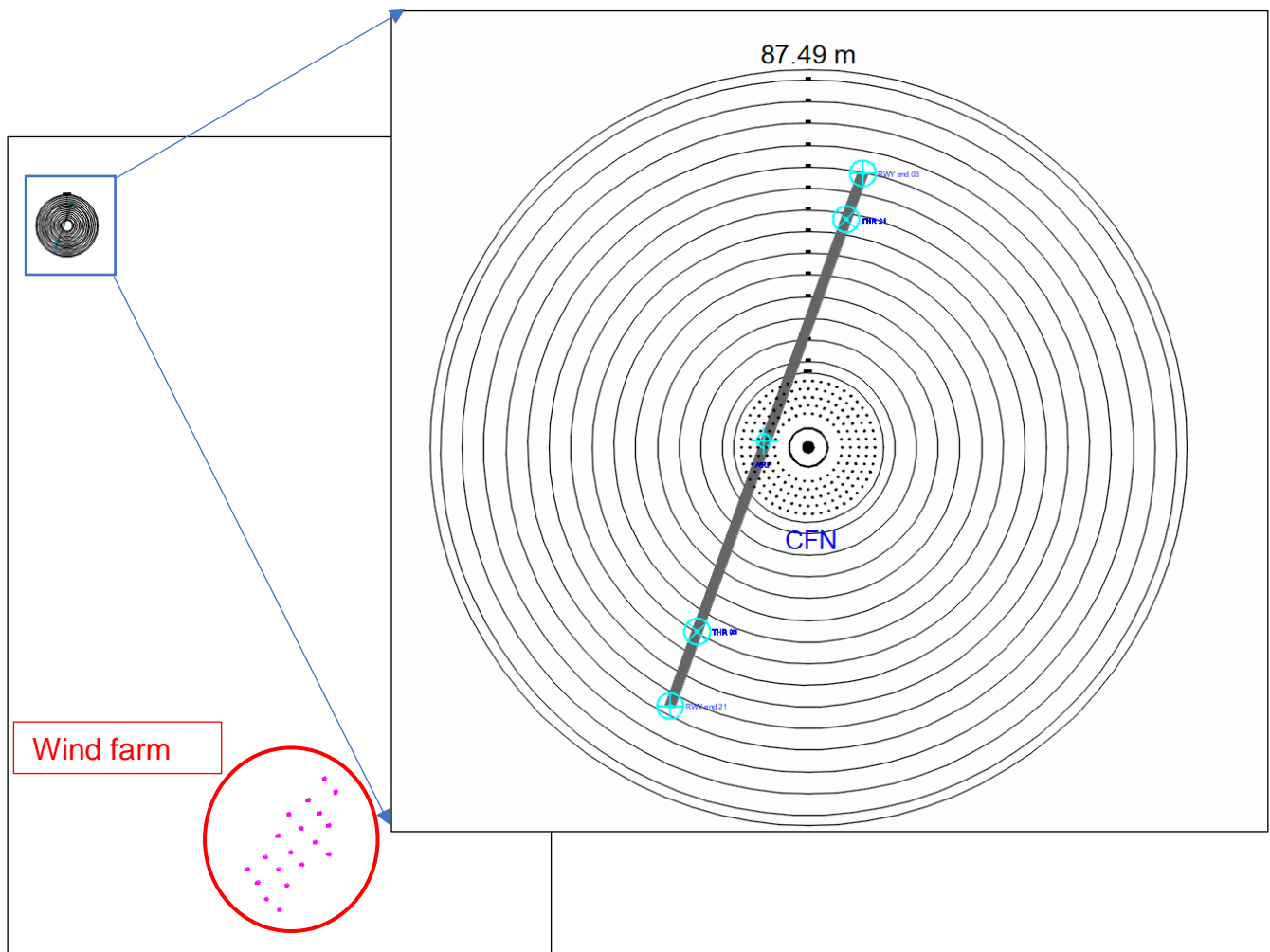


**European guidance material on managing Building Restricted Areas, Figure 2.2: side elevation view*

3.1.1 NDB shielding

The NDB shielding volume is defined as follows:

Type of navigation facilities	Radius (r - Cylinder) (m)	Alpha (α -cone) ($^{\circ}$)	Radius (R-Cone) (m)	Radius (j - Cylinder) (m) Wind turbine(s) only	Height of cylinder j (h -height) (m) Wind turbine(s) only	Origin of cone and axis of cylinders
NDB	200	5.0	1000	N/A	N/A	Base of antenna at ground level



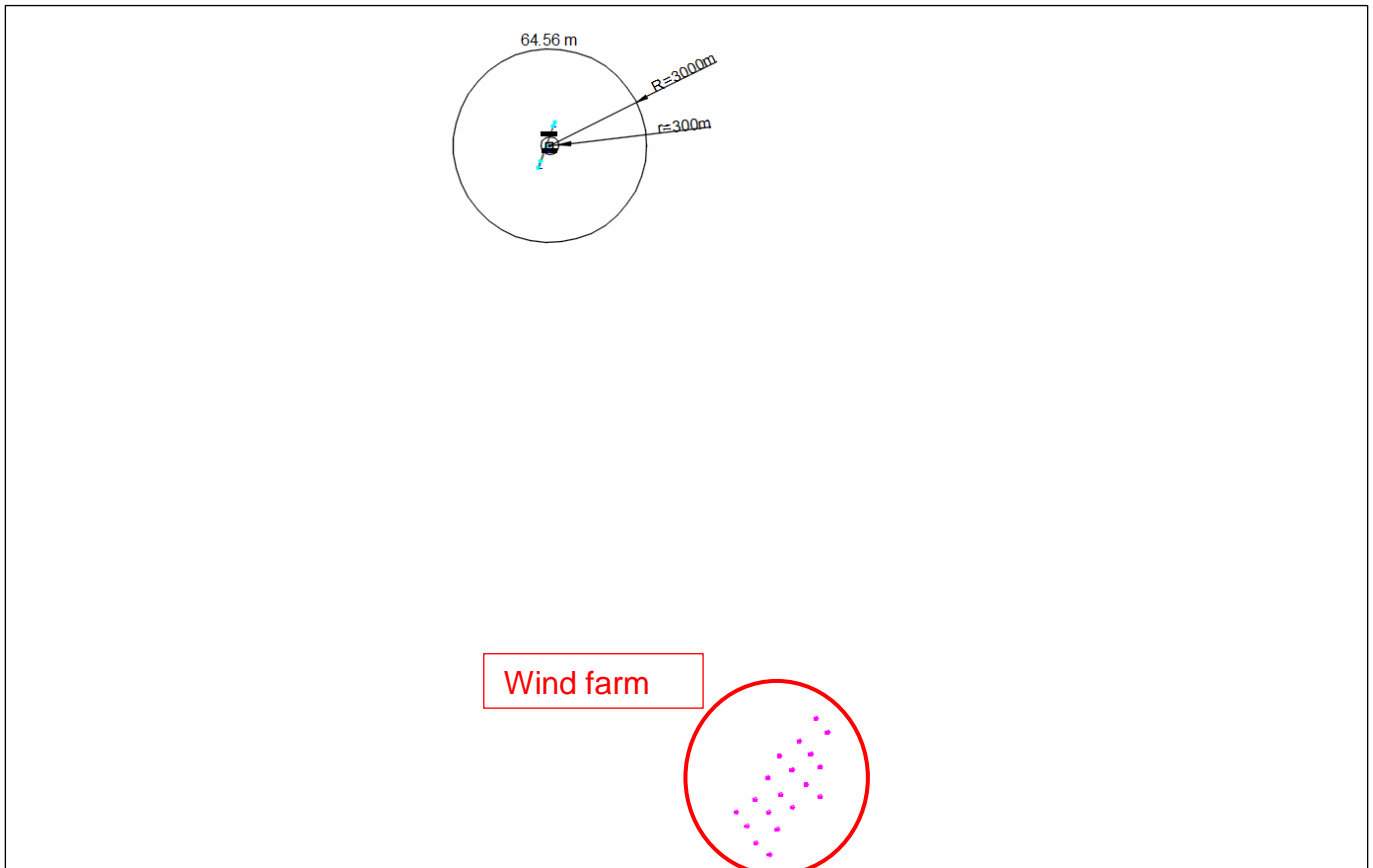
As can be seen in the previous diagram the proposed Cloghercor Wind Farm is outside the NDB shielding surfaces.

The NDB shielding surface is not affected by the proposed Cloghercor Wind Farm.

3.1.2 DME N shielding

The DME N shielding volume is defined as follows:

Type of navigation facilities	Radius (r - Cylinder) (m)	Alpha (α -cone) ($^{\circ}$)	Radius (R-Cone) (m)	Radius (j - Cylinder) (m) Wind turbine(s) only	Height of cylinder j (h -height) (m) Wind turbine(s) only	Origin of cone and axis of cylinders
DME N	300	1.0	3000	N/A	N/A	Base of antenna at ground level

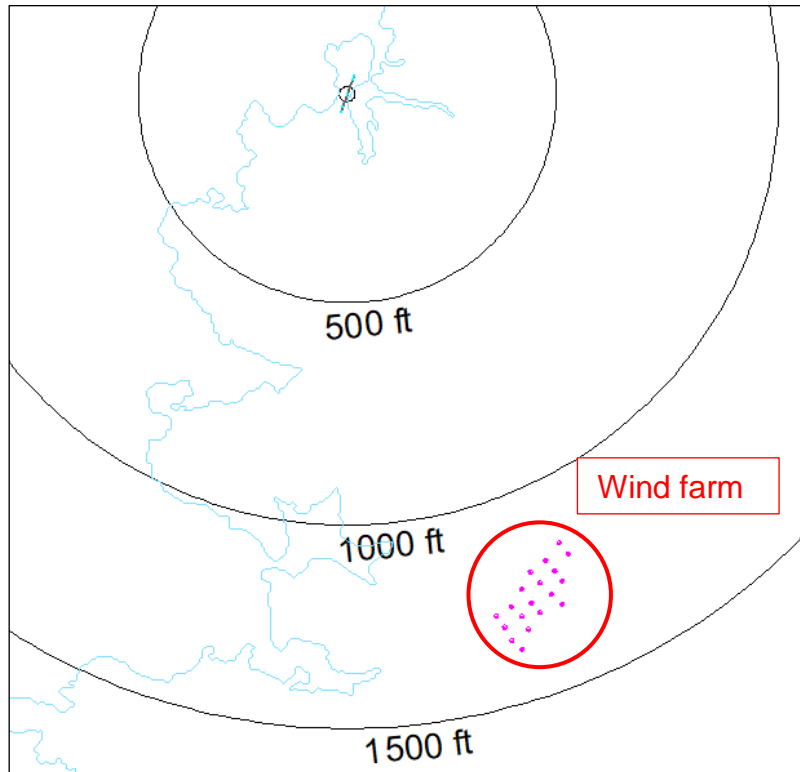


As can be seen in the previous diagram the proposed Cloghercor Wind Farm is outside the DME N shielding surface.

The DME N shielding surface is not affected by the proposed Cloghercor Wind Farm.

3.1.3 VHF transmissions

The following diagram represents the area, where the Wind farm may affect the operational coverage of ATC VHF transmissions.

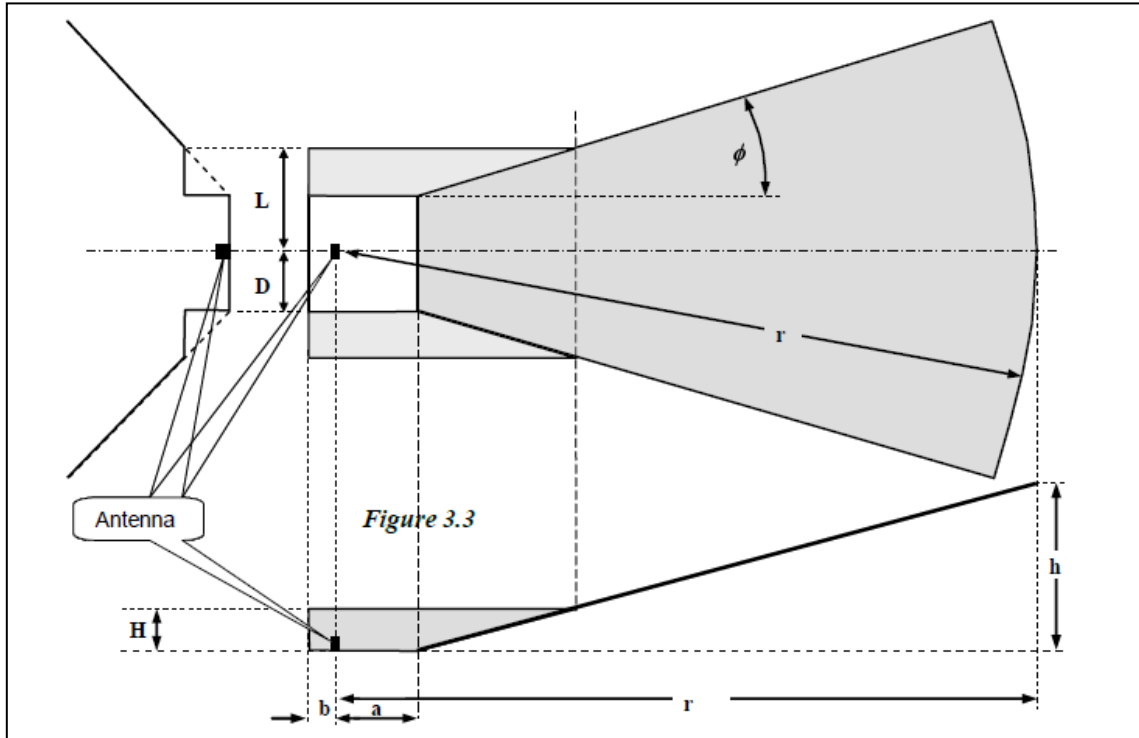


As can be seen in the previous diagram, the proposed Cloghercor Wind Farm could affect ATC transmissions to aircraft at an altitude between 1000 ft and 1500 ft. However the terrain in this area is 1000 ft to 2000 ft. Aircraft will not be in this area at these unsafe and dangerous altitudes.

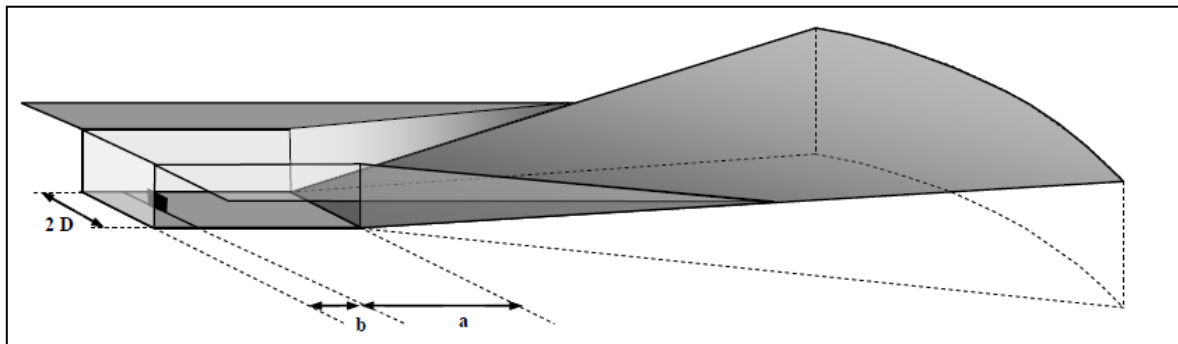
The proposed Cloghercor Wind Farm will not affect ATC VHF transmissions.

3.2 Shielding for directional facilities

The Shielding volume for directional facilities is defined as follows:



**European guidance material on managing Building Restricted Areas, Figure 3.1, 3.2, 3.3: Directional facilities shape*

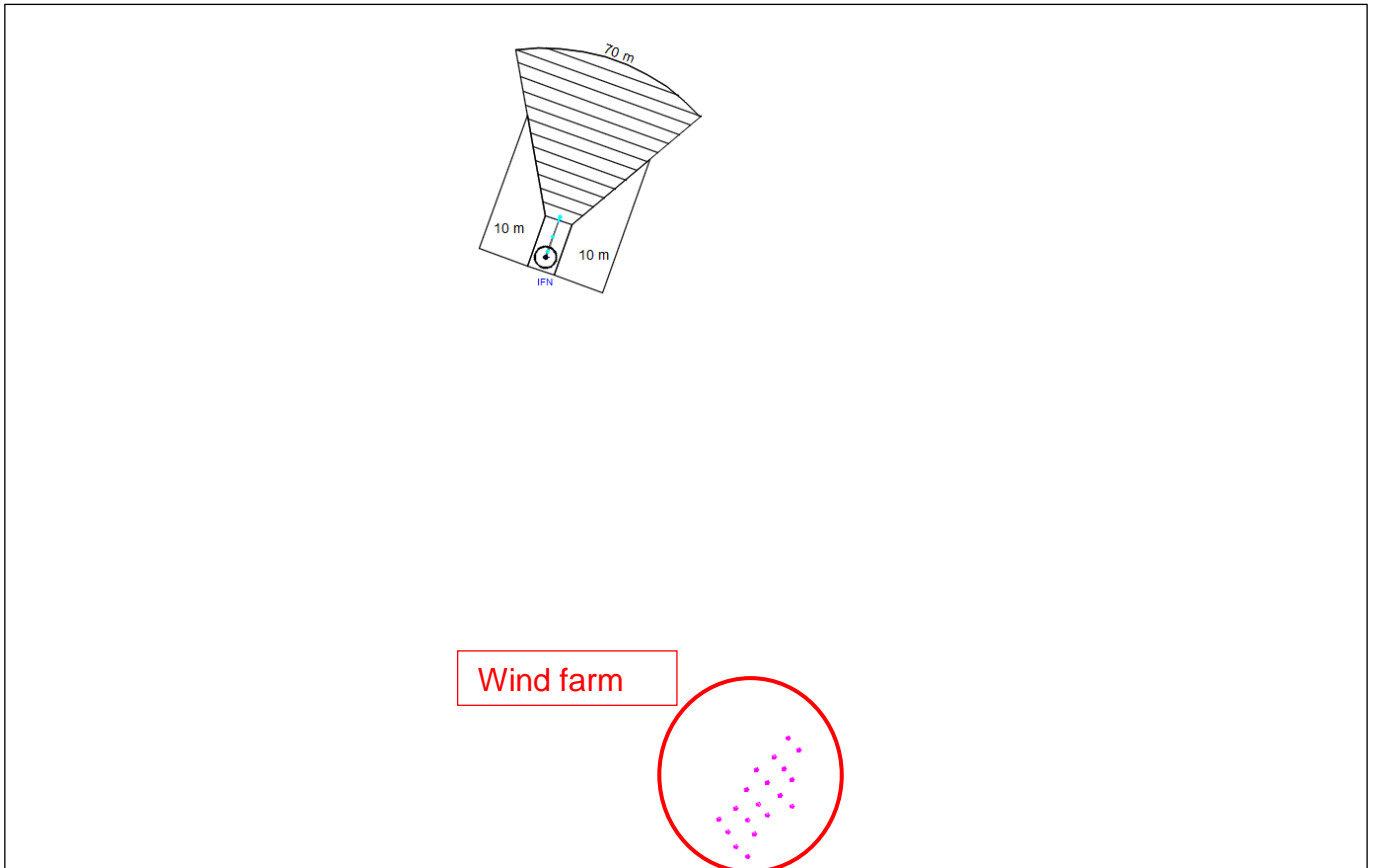


**European guidance material on managing Building Restricted Areas, Figure 3.4: Directional facilities perspective*

3.2.1 ILS LLZ shielding

The Shielding volume for ILS LLZ is defined as follows:

Type of navigation facilities	A (m)	b (m)	h (m)	r (m)	D (m)	H (m)	L (m)	∅ (°)
ILS LLZ (dual frequency)	Distance to threshold	500	70	A+6000	500	20	1500	20



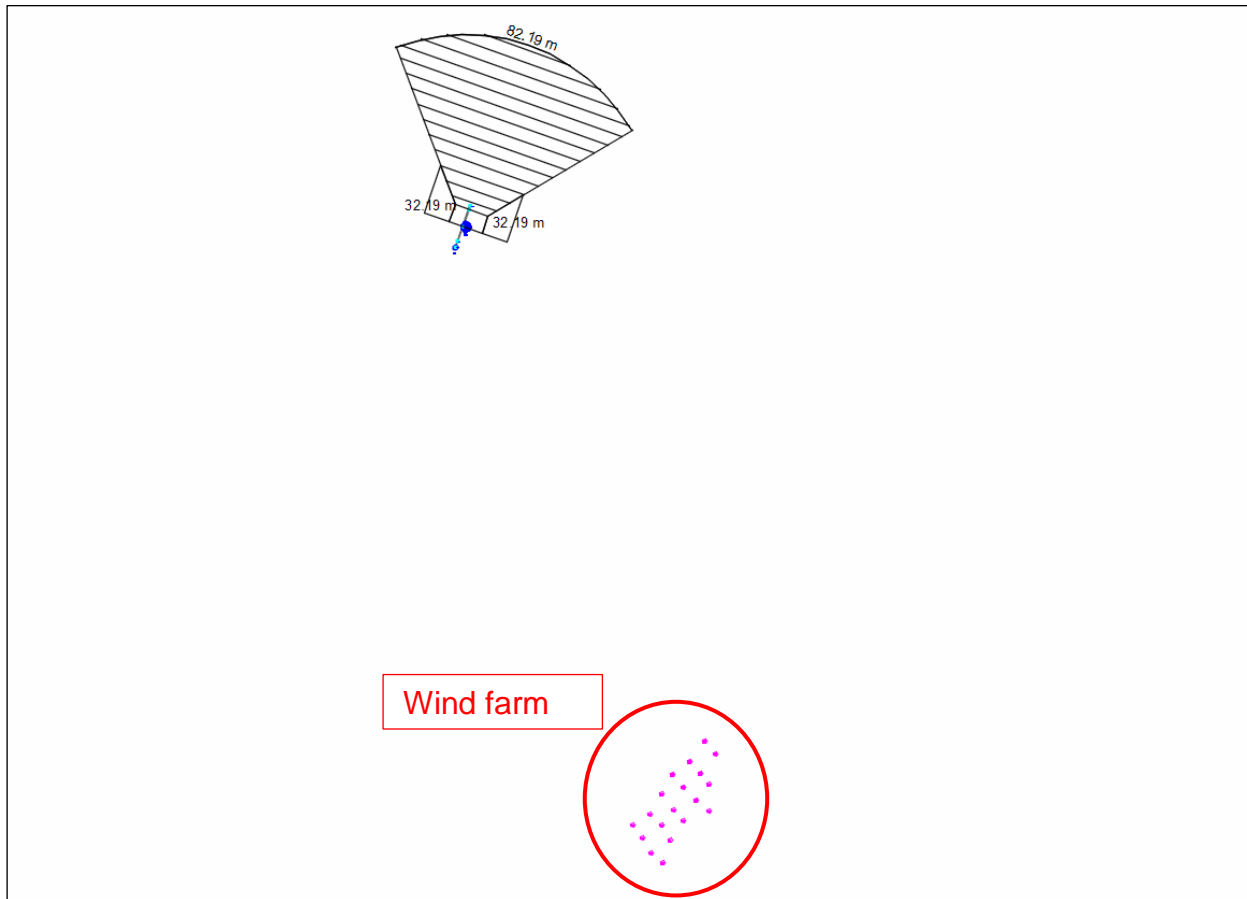
As can be seen in the previous diagram the proposed Cloghercor Wind Farm is outside the ILS LOC shielding surface.

The ILS LLZ shielding surface is not affected by the proposed Cloghercor Wind Farm.

3.2.3 ILS DME shielding

The Shielding volume for ILS DME is defined as follows:

Type of navigation facilities	A (m)	b (m)	h (m)	r (m)	D (m)	H (m)	L (m)	∅ (°)
DME (directional antenna)	Distance to threshold	20	70	A+6000	600	20	1500	40



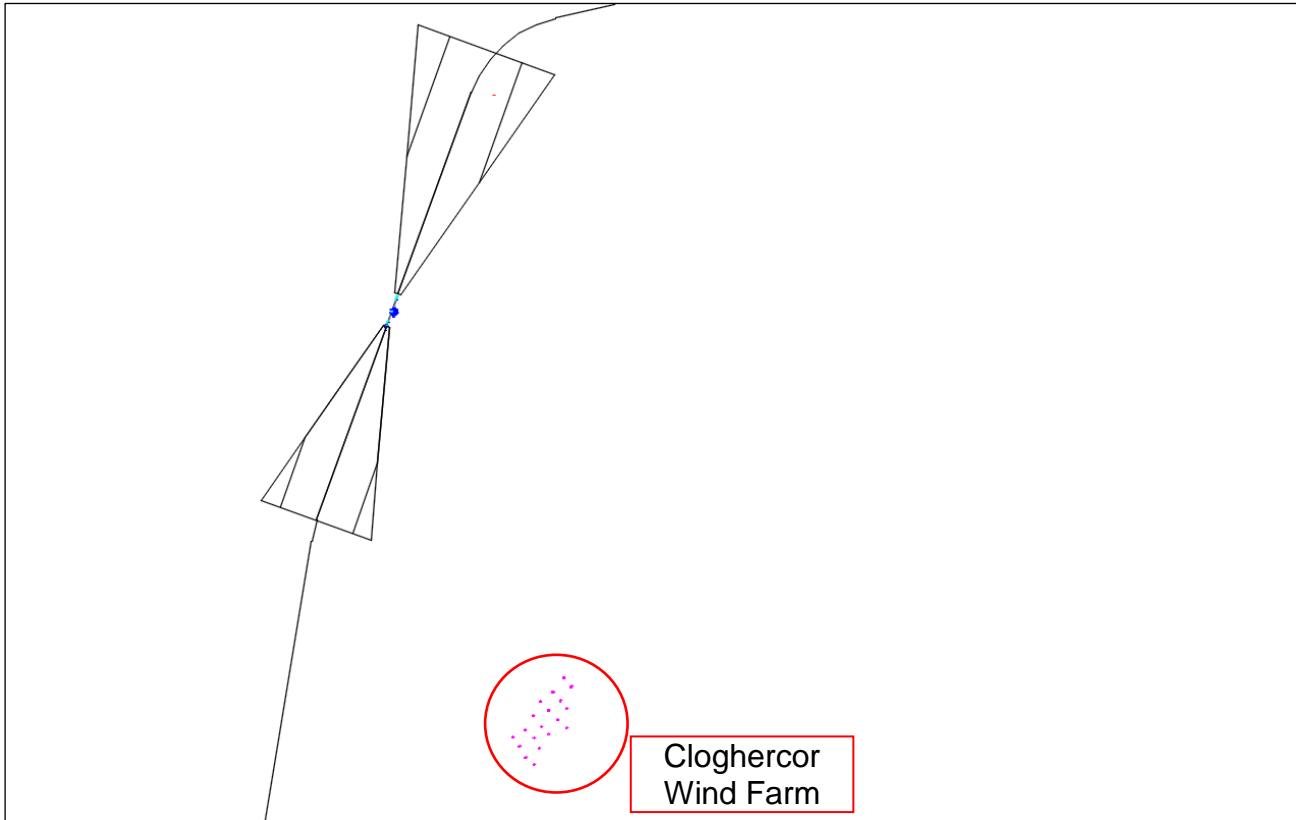
As can be seen in the previous diagram the proposed area was outside the DME IFN shielding surface.

The DME IFN shielding surface is not affected by the proposed Cloghercor Wind Farm.

4. Preliminary assessment

4.1 Departures

4.1.1 Straight ahead area

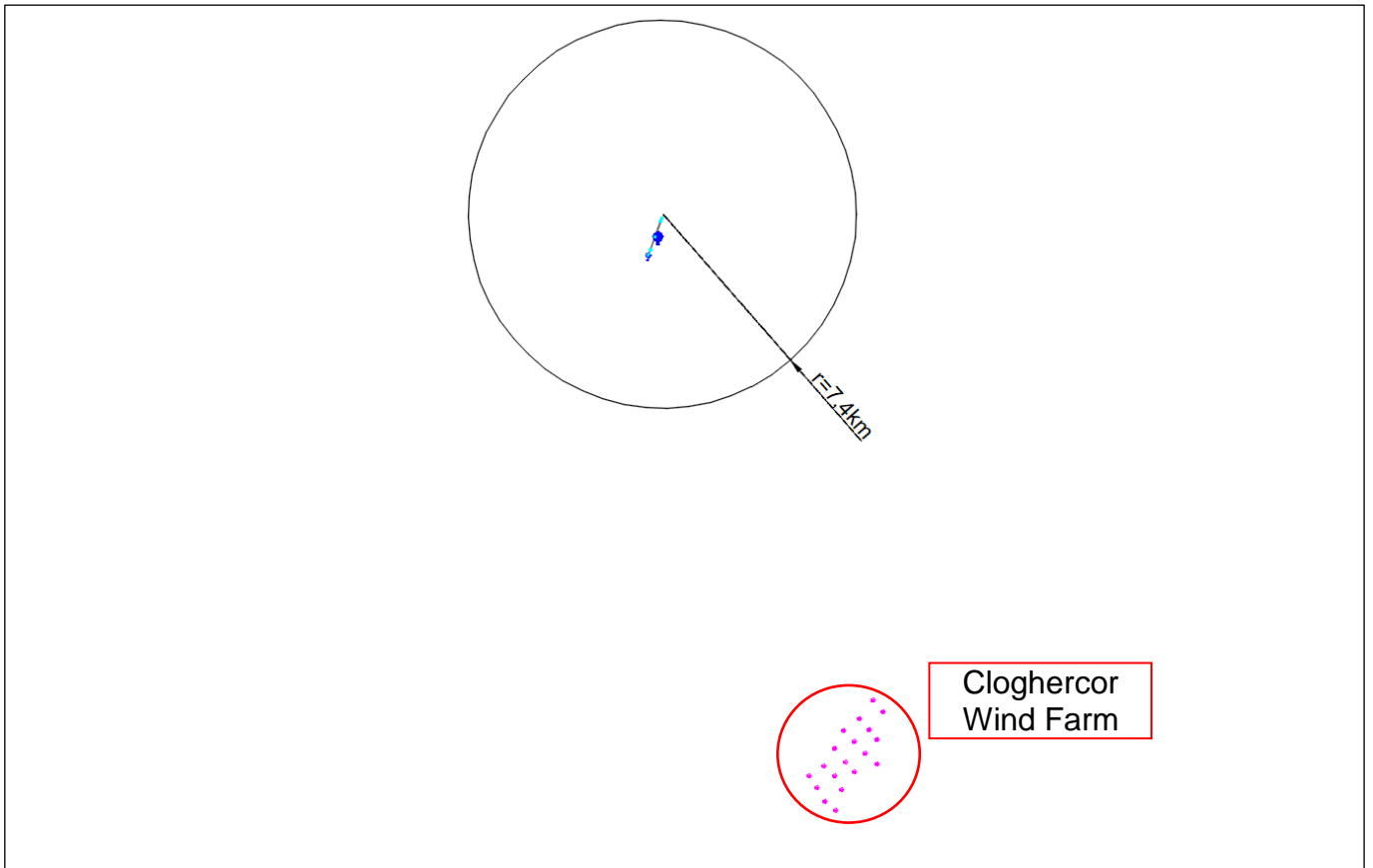


As can be seen in the previous diagram the proposed Cloghercor Wind Farm is not within the straight obstacle protection areas for the departures off any runway at Donegal. No further checking of the straight departure areas is required.

4.1.2 Area after the turn

All aircraft category A, B & C departures on runway 03 turn at an altitude of 1400 ft while aircraft on runway 21 turn at an altitude of 1200 ft. After the turn a MOC of 0.8% of the distance to the obstacle is applicable.

If the aircraft altitude at the commencement of the turn is above the proposed structure then a certain amount of MOC already exists. The MOC value equates to the difference between the turn altitude and the elevation of the proposed structure. This MOC value can then be associated with an omnidirectional distance from the DER at which it is applicable. If the proposed structure is within this distance from the DER then the required MOC or more is being applied already at the commencement of the departure turn. If the proposed structure is outside this distance from the DER then the required MOC must be assessed.



Departure	Turn Alt. (ft)	MOC achieved (ft)	MOC>75m	0.8% MOC Radius (km)	Outside Radius	Full assessment required
RWY03	1400	194	NO	7.4	Yes	YES
RWY21	1200	-6	NO	-0.2	Yes	YES

As can be seen in the previous diagram and table the proposed Cloghercor Wind Farm is outside the safe MOC distance. Therefore, a more in-depth assessment of the departures is required, see section 5.1 Standard Instrument departures (SIDs).

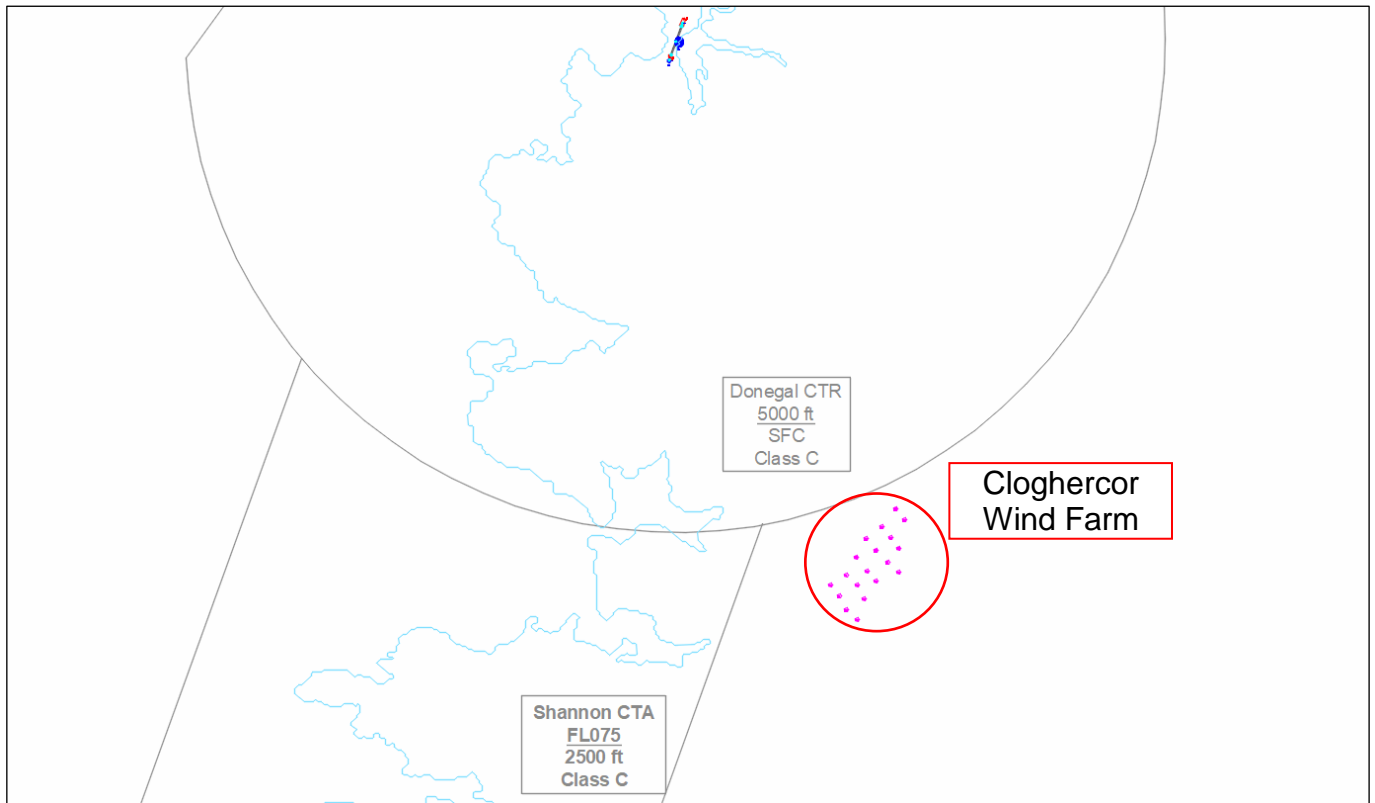
4.2 STARs (Standard Instrument arrivals)

The highest structure of the proposed Cloghercor Wind Farm has an AMSL elevation of 367.6 m. The ICAO minimum obstacle clearance (MOC) in the primary obstacle protection area for an arrival route is 300 m. If the published minimum OCA is greater than the elevation of the proposed structure plus the MOC of 300m then the structure is not critical for that procedure but if it is not then a more in-depth assessment would be required when the proposed structure is inside the obstacle protection areas. See the following table for this initial assessment.

ID	Alt.	MOC	MOCA (ft)	ASAP Proposed OCA (ft)	MOC achieved
P9	367.6	300.0	2190.3	3000	809.7

As can be seen in the previous table the arrival routes are not affected by the Cloghercor Wind Farm.

4.3 Approach procedures



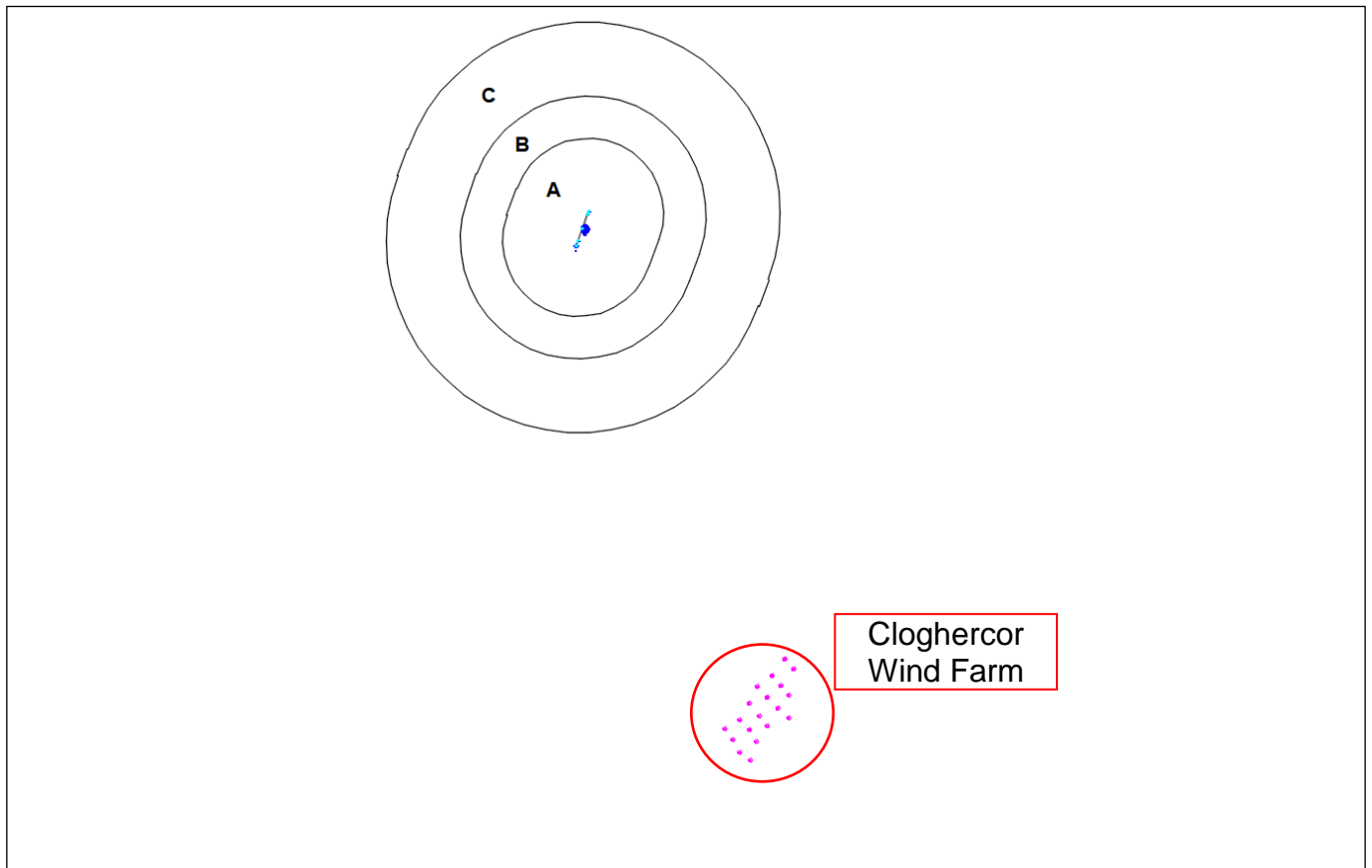
As can be seen in the previous diagram, the Wind farm is situated outside Donegal controlled airspace. All the approach procedures are designed to be contained within controlled airspace. No further check of the final and missed approach procedures is required.

The ICAO minimum obstacle clearance (MOC) in the primary obstacle protection area for a reversal or racetrack procedure is 300 m. If the published minimum obstacle clearance altitude (MOCA) is greater than the elevation of the proposed structure plus the MOC of 300m then the structure is not critical for that procedure but if it is not then a more in-depth assessment would be required when the proposed structure is within the associated obstacle protection areas. See the following table for this initial assessment.

ID	Alt.	MOC	MOCA (ft)	IAF procedure altitude (ft)	MOC achieved
P9	367.6	300.0	2190.3	3000	809.7

As can be seen in the previous table none of the approaches is affected by the Cloghercor Wind Farm.

4.4 Visual manoeuvring



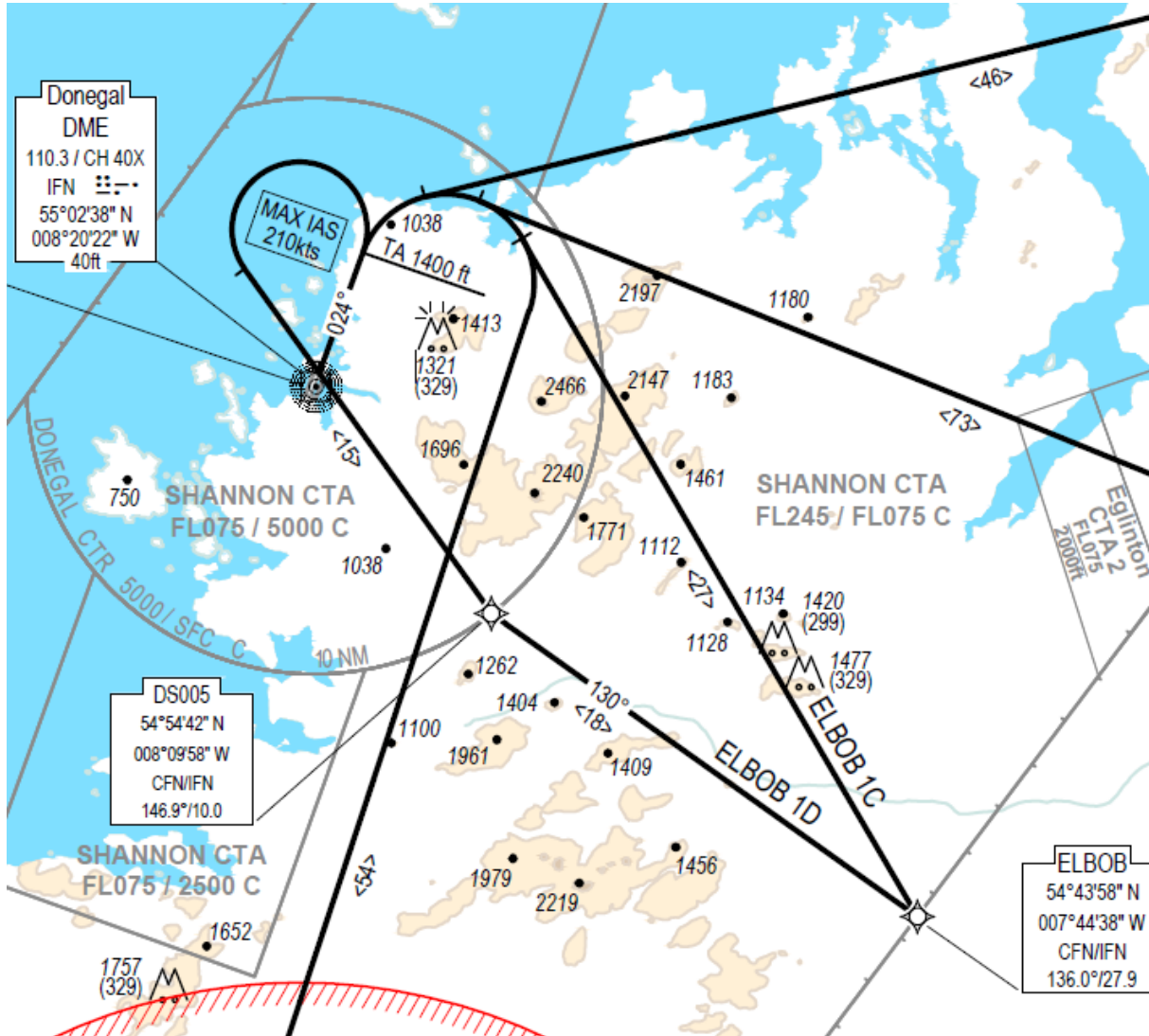
As can be seen in the previous diagram, the wind farm is outside the visual circling obstacle protection area.

The visual manoeuvring is not affected by the Cloghercor Wind Farm.

5. In-depth procedure assessment

5.1 Standard Instrument departures (SIDs)

5.1.1 Runway 03



The RNAV protection areas were constructed using the following parameters:

Runway	
DER	
ID	CWY03 end
Latitude	55°03'06.35"N
Longitude	008°20'09.95"W
Altitude	9.45 m (31 ft)
Direction	019.85 °
Parameters	
ARP	
Latitude	55°02'39.00"N

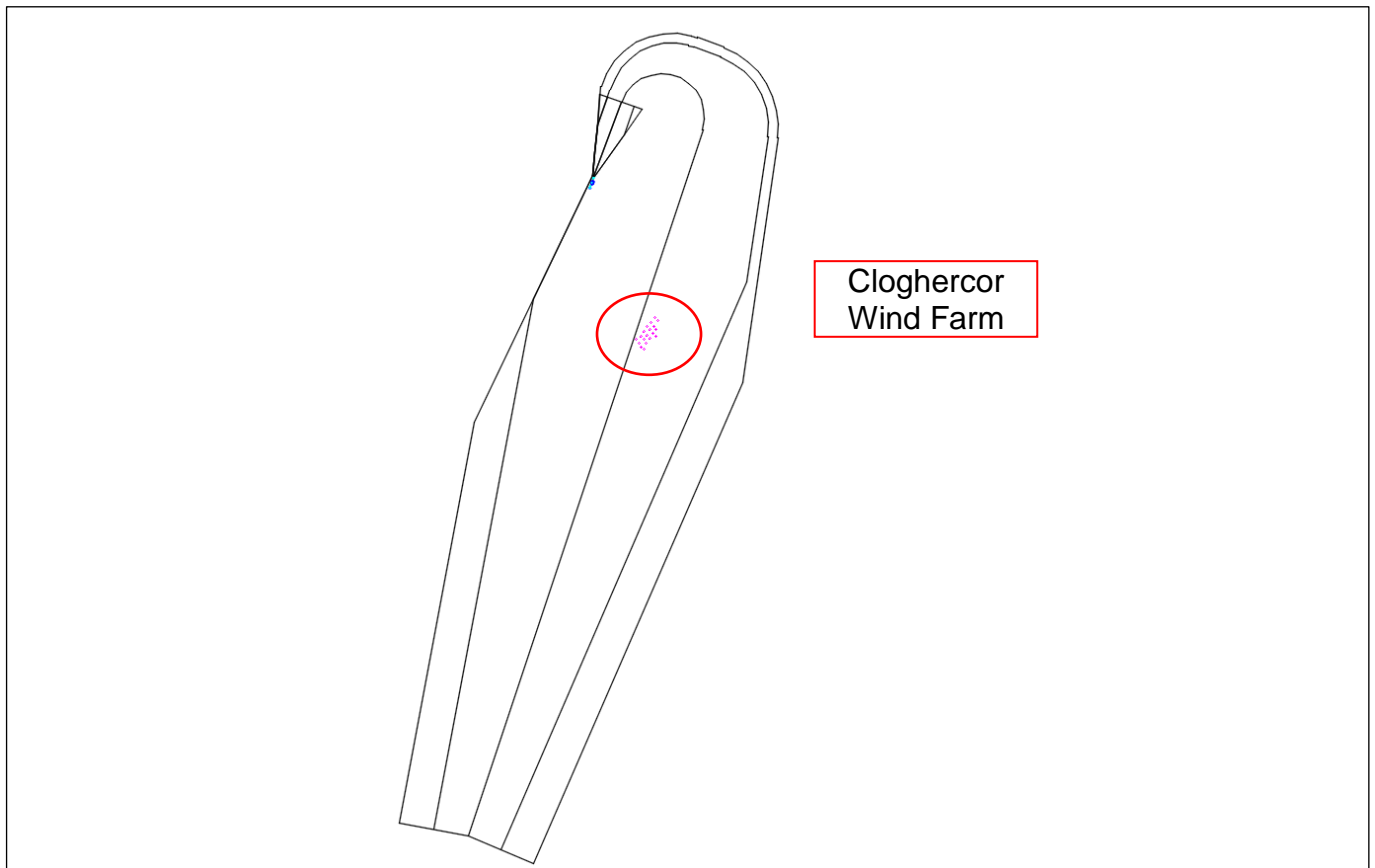
Longitude	008°20'28.00"W
Course	020.40 °(T)
Altitude	1400 ft
Specification	RNAV 1
Track	019.85 °
MOC	0.8 %
PDG	4 %
2nd PDG	3.3 %
Clean-up Altitude	1700 ft

5.1.1.1 SLG 1C

The turn protection areas were constructed using the following parameters:

Waypoint	
ID	1400 ft
Latitude	55°08'18.82"N
Longitude	008°16'47.09"W
Altitude	9.45 m (31 ft)
Track TO	020.4 °
Track FROM	192.3 °
Course Change	171.86 °
Turn Direction	Right
Tolerances	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm

Turn Protection Area	
IAS	240 kts
IAS + 10%	264 kts
Altitude	1400 ft
ISA	15 °C
Bank Angle	15 °
Wind	30 kts
TAS	276.5 kts
r	7699.84 m
E	1312.35 m
$\sqrt{r^2 + E^2}$	7810.88 m
r + E	9012.2 m
r + 2E	10324.55 m



As can be seen in the previous diagram the proposed structure is situated inside the turn protection area.

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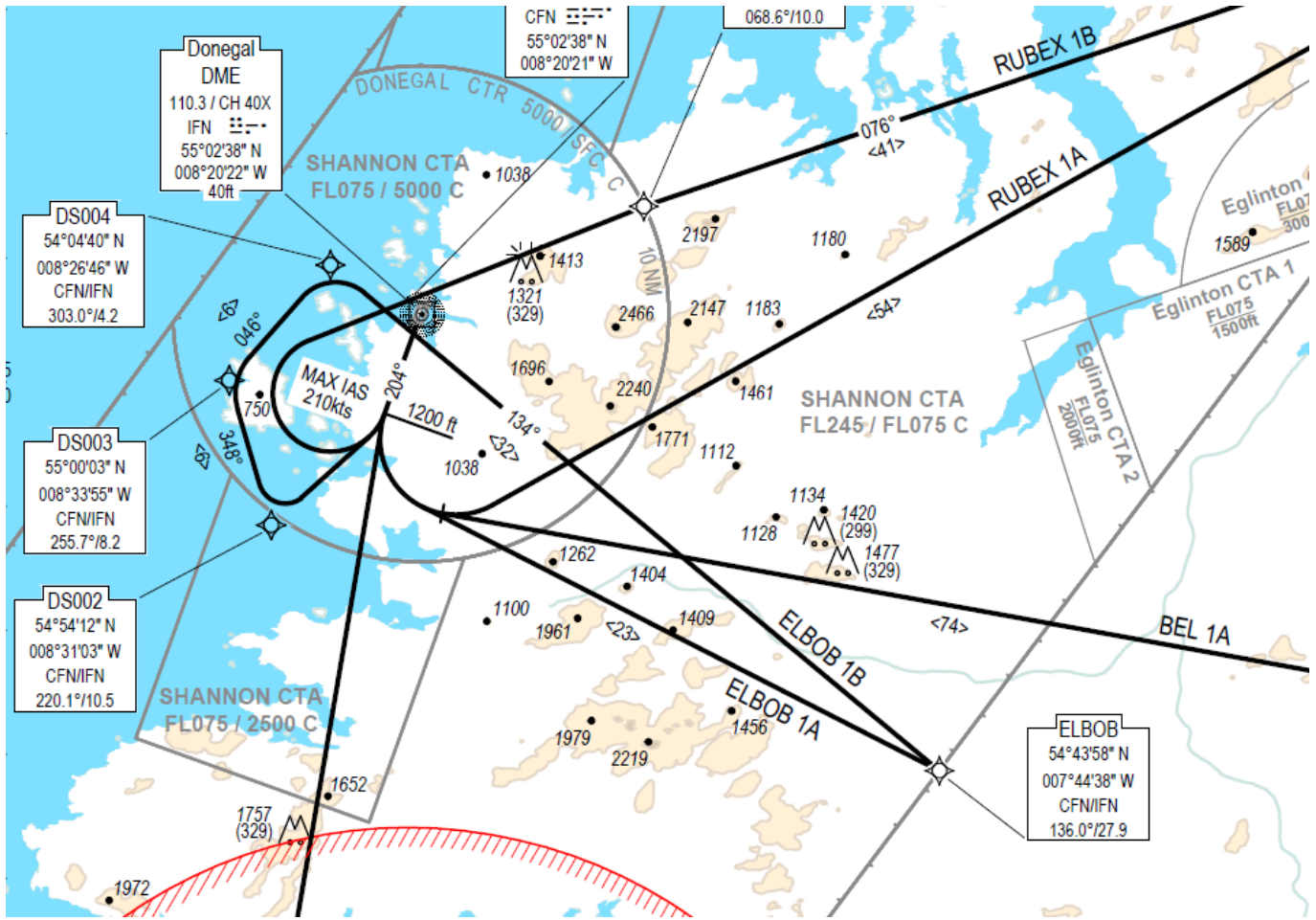


Assessment

ID	Alt.	Do	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	Cont.
P11	366.5	22243.5	177.9	3860.8	1786.2	No
P10	364.4	22226.8	177.8	3858.9	1778.9	No
P9	367.6	21712.3	173.7	3803.2	1775.9	No
P19	353.6	23412.8	187.3	3987.3	1774.7	No
P15	357.4	22739.6	181.9	3914.5	1769.4	No
P5	342.0	21372.3	171.0	3766.4	1683.1	No
P18	328.1	22970.8	183.8	3939.5	1679.4	No
P13	331.8	22171.5	177.4	3853.0	1670.6	No
P16	302.7	22392.5	179.1	3876.9	1580.7	No
P12	303.1	21770.4	174.2	3809.5	1565.9	No
P2	315.2	20479.3	163.8	3669.7	1571.5	No
P8	308.0	21146.2	169.2	3741.9	1565.5	No
P7	300.9	21146.6	169.2	3742.0	1542.3	No
P4	301.2	20906.5	167.3	3716.0	1536.9	No
P14	291.6	21681.9	173.5	3799.9	1525.8	No
P17	289.2	21894.4	175.2	3823.0	1523.4	No
P6	298.1	20608.2	164.9	3683.7	1518.8	No
P3	249.3	20393.2	163.1	3660.4	1353.0	No
P1	248.5	19949.6	159.6	3612.4	1339.0	No

As can be seen in the previous table the Standard Instrument Departures (SID's) from Runway 03 are not affected by the proposed structure.

5.1.2 Runway 21



The RNAV protection areas were constructed with the following parameters:

DER	
ID	RWY21 end
Latitude	55°02'16.41"N
Longitude	008°20'42.28"W
Altitude	2.99 m (9.8 ft)
Direction	199.85 °
ARP	
Latitude	55°02'39.00"N
Longitude	008°20'28.00"W

Course	200.39 °(T)
Altitude	1200 ft
Specification	RNAV 1
Track	199.85 °
MOC	0.8 %
PDG	3.6 %

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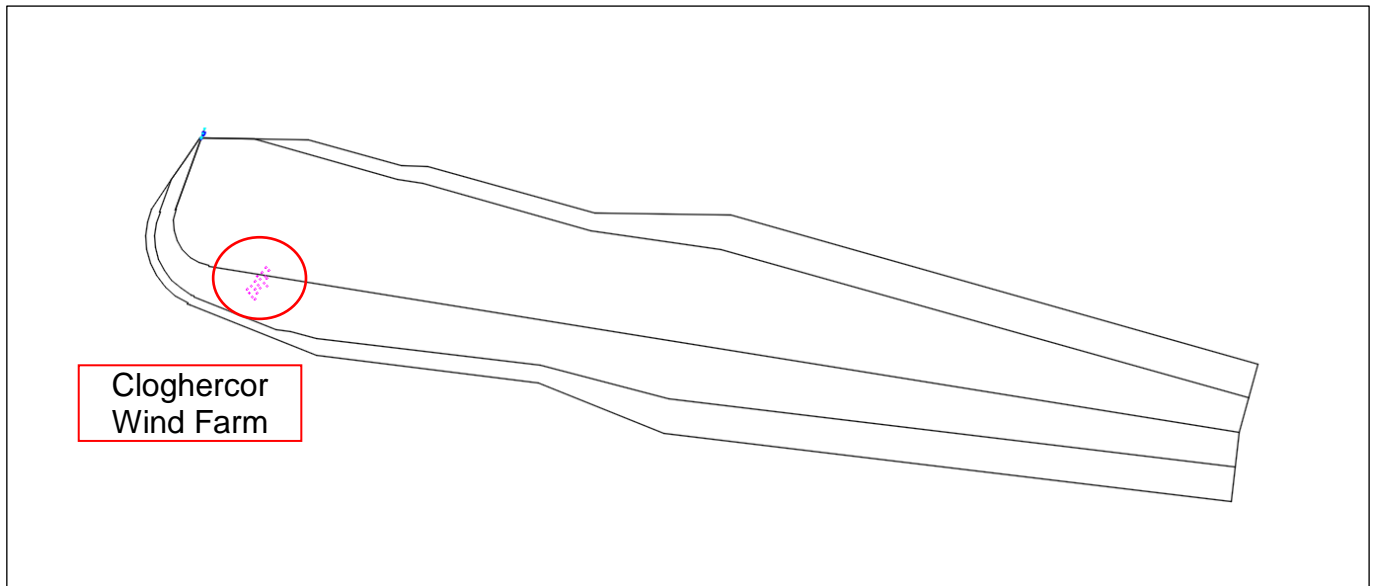


5.1.2.1 BEL 1A

The turn protection areas were constructed using the following parameters:

ID	1200 ft
Latitude	54°57'15.00"N
Longitude	008°23'56.87"W
Altitude	2.99 m (9.8 ft)
Track TO	200.39 °
Track FROM	102.28 °
Course Change	098.06 °
Turn Direction	Left
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm
IAS	240 kts

IAS + 10%	264 kts
Altitude	1200 ft
ISA	15 °C
Bank Angle	15 °
Wind	30 kts
TAS	275.7 kts
r	7653.98 m
E	1308.44 m
$\sqrt{r^2 + E^2}$	7765.01 m
r + E	8962.42 m
r + 2E	10270.86 m



As can be seen in the previous diagram the proposed structure is situated inside the turn protection area.

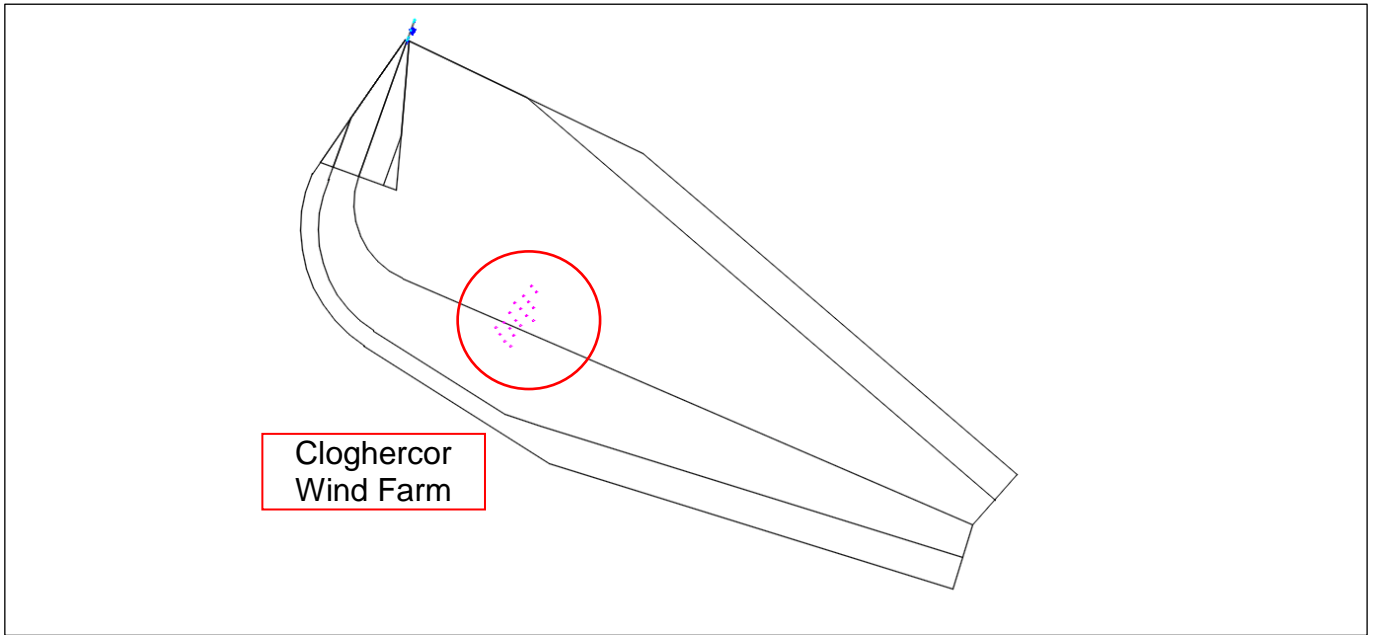
Assessment

ID	Alt.	Do	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	Cont.
P9	367.6	12380.6	178.5	2662.3	1791.8	No
P11	366.5	12593.8	180.3	2687.5	1793.8	No
P10	364.4	12962.7	183.2	2731.0	1796.5	No
P15	357.4	12800.2	181.9	2711.8	1769.4	No
P19	353.6	13267.5	185.6	2767.0	1769.3	No
P5	342.0	12345.5	178.3	2658.1	1707.0	No
P13	331.8	12235.3	177.4	2645.1	1670.7	No
P18	328.1	12747.9	181.5	2705.7	1671.9	No
P2	315.2	11858.4	174.4	2600.6	1606.1	No
P8	308.0	11420.4	170.9	2548.9	1571.1	No
P12	303.1	12078.2	176.1	2626.6	1572.4	No
P16	302.7	12156.3	176.8	2635.8	1572.9	No
P4	301.2	11870.9	174.5	2602.1	1560.6	No
P7	300.9	11762.3	173.6	2589.3	1556.8	No

ID	Alt.	Do	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	Cont.
P6	298.1	11181.8	169.0	2520.7	1532.2	No
P14	291.6	11673.2	172.9	2578.7	1523.9	No
P17	289.2	11619.1	172.5	2572.3	1514.6	No
P3	249.3	11333.3	170.2	2538.6	1376.0	No
P1	248.5	11321.8	170.1	2537.2	1373.4	No

As can be seen in the previous table, the Standard Instrument Departure (SID) BEL 1A from Runway 21 is not affected by the proposed structure.

5.1.2.1 ELBOB 1C



As can be seen in the previous diagram the proposed structure is situated inside the turn protection area.

The turn protection areas were constructed using the following parameters:

ID	1200 ft
Latitude	54°57'15.00"N
Longitude	008°23'56.87"W
Altitude	2.99 m (9.8 ft)
Track TO	200.39 °
Track FROM	120.08 °
Course Change	080.26 °
Turn Direction	Left
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm
IAS	240 kts

IAS + 10%	264 kts
Altitude	1200 ft
ISA	15 °C
Bank Angle	15 °
Wind	30 kts
TAS	275.7 kts
r	7653.98 m
E	1308.44 m
$\sqrt{r^2 + E^2}$	7765.01 m
r + E	8962.42 m
r + 2E	10270.86 m

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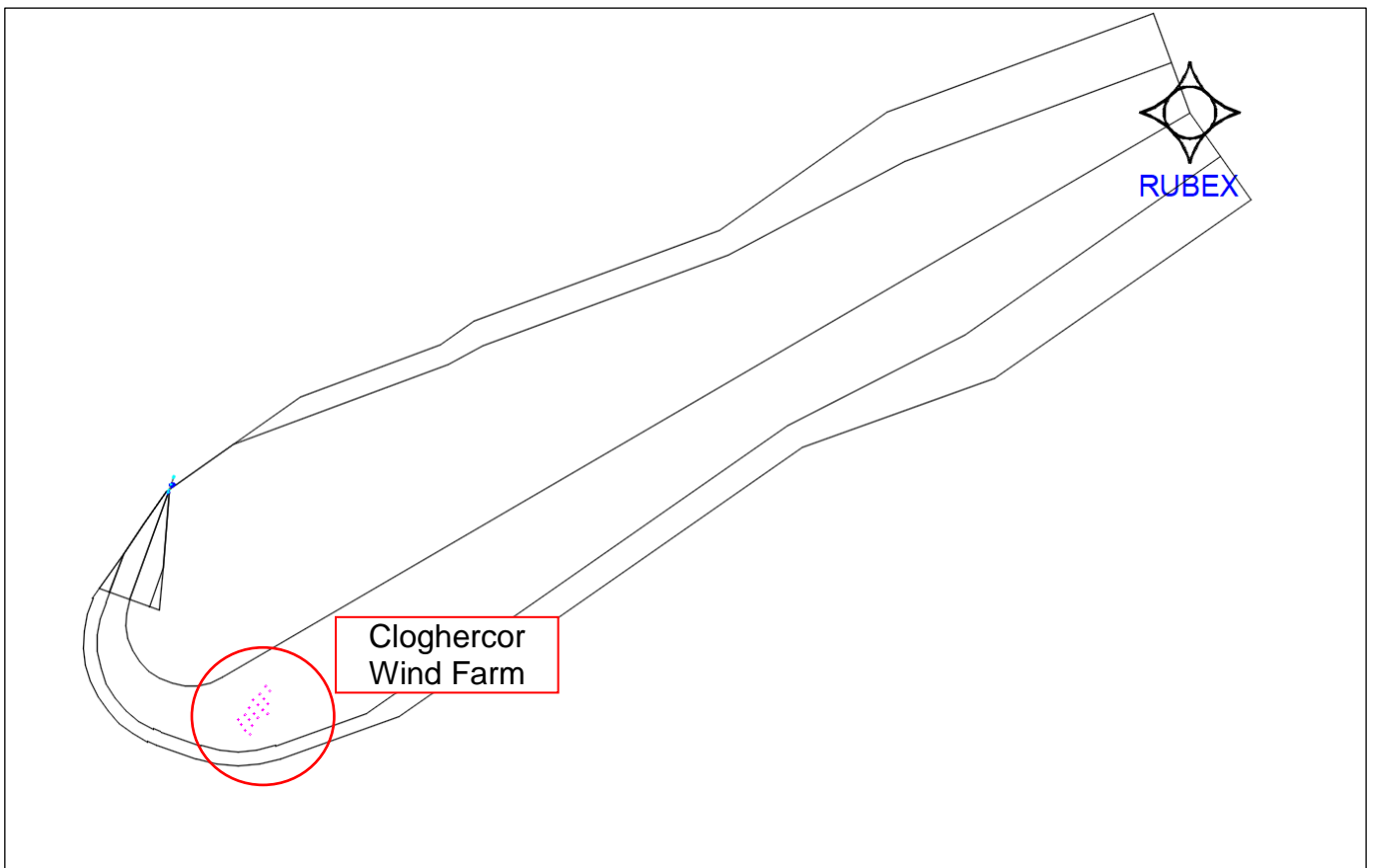


Assessment

ID	Alt.	Do	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	Cont.
P9	367.6	12380.6	178.5	2582.1	1791.8	No
P11	366.5	12593.8	180.3	2605.2	1793.8	No
P10	364.4	12962.7	183.2	2645.1	1796.5	No
P15	357.4	12800.2	181.9	2627.5	1769.4	No
P19	353.6	13267.5	185.6	2678.1	1769.3	No
P5	342.0	12345.5	178.3	2578.3	1707.0	No
P18	328.1	12747.9	181.5	2621.9	1671.9	No
P13	331.8	12235.3	177.4	2566.4	1670.7	No
P2	315.2	11858.4	174.4	2525.5	1606.1	No
P16	302.7	12156.3	176.8	2557.8	1572.9	No
P12	303.1	12078.2	176.1	2549.3	1572.4	No
P8	308.0	11420.4	170.9	2478.1	1571.1	No
P4	301.2	11870.9	174.5	2526.9	1560.6	No
P7	300.9	11762.3	173.6	2515.1	1556.8	No
P14	291.6	11673.2	172.9	2505.5	1523.9	No
P6	298.1	11181.8	169.0	2452.3	1532.2	No
P17	289.2	11619.1	172.5	2499.6	1514.6	No
P3	249.3	11333.3	170.2	2468.7	1376.0	No
P1	248.5	11321.8	170.1	2467.5	1373.4	No

As can be seen in the previous table, the Standard Instrument Departure (SID) ELBOB 1C from Runway 21 is not affected by the proposed structure.

5.1.2.1 RUBEX 1A





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As can be seen in the previous diagram the proposed structure is situated inside the turn protection area.

The turn protection areas were constructed using the following parameters:

ID	1200 ft
Latitude	54°57'15.00"N
Longitude	008°23'56.87"W
Altitude	2.99 m (9.8 ft)
Track TO	200.39 °
Track FROM	065.83 °
Course Change	134.51 °
Turn Direction	Left
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm
Turn Protection Area	

IAS	240 kts
IAS + 10%	264 kts
Altitude	1200 ft
ISA	15 °C
Bank Angle	15 °
Wind	30 kts
TAS	275.7 kts
r	7653.98 m
E	1308.44 m
$\sqrt{r^2 + E^2}$	7765.01 m
r + E	8962.42 m
r + 2E	10270.86 m

Assessment

ID	Alt.	Do	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	Cont.
P9	367.6	12380.6	178.5	2662.3	1791.8	No
P11	366.5	12593.8	180.3	2687.5	1793.8	No
P10	364.4	12962.7	183.2	2731.0	1796.5	No
P15	357.4	12800.2	181.9	2711.8	1769.4	No
P19	353.6	13267.5	185.6	2767.0	1769.3	No
P5	342.0	12345.5	178.3	2658.1	1707.0	No
P13	331.8	12235.3	177.4	2645.1	1670.7	No
P18	328.1	12747.9	181.5	2705.7	1671.9	No
P2	315.2	11858.4	174.4	2600.6	1606.1	No
P8	308.0	11420.4	170.9	2548.9	1571.1	No
P12	303.1	12078.2	176.1	2626.6	1572.4	No
P16	302.7	12156.3	176.8	2635.8	1572.9	No
P4	301.2	11870.9	174.5	2602.1	1560.6	No
P7	300.9	11762.3	173.6	2589.3	1556.8	No
P6	298.1	11181.8	169.0	2520.7	1532.2	No
P14	291.6	11673.2	172.9	2578.7	1523.9	No
P17	289.2	11619.1	172.5	2572.3	1514.6	No
P3	249.3	11333.3	170.2	2538.6	1376.0	No
P1	248.5	11321.8	170.1	2537.2	1373.4	No

As can be seen in the previous table, the Standard Instrument Departure (SID) RUBEX 1A from Runway 21 is not affected by the proposed structure.

As can be seen in the previous assessments the Standard Instrument Departures (SID's) from Runway 21 are not affected by the proposed structure.

6. Risk Assessment

6.1 Risk value explanation

To simplify the risk evaluation ASAP has created simplified risk assessment values from the guidelines as laid out in ICAO Safety Management Manual (SMM), document 9859 Part 6.

Included in the following ICAO table is how the ASAP risk assessment values correspond to the ICAO values.

Table 6-1. ICAO Risk assessment matrix principles + ASAP values

SEVERITY OF CONSEQUENCES			LIKELIHOOD OF OCCURRENCE			ASAP risk assessment	
Aviation definition	Meaning	Value	Qualitative definition	Meaning	Value	Meaning	Value
Catastrophic	Equipment destroyed. Multiple deaths.	5	Frequent	Likely to occur many times	5	High risk	5
Hazardous	A large reduction in safety margins, physical distress or a workload such that the operators cannot be relied upon to perform their tasks accurately or completely. Serious injury or death to a number of people. Major equipment damage.	4	Occasional	Likely to occur sometimes	4		
Major	A significant reduction in safety margins, a reduction in the ability of the operators to cope with adverse operating conditions as a result of an increase in workload, or as a result of conditions impairing their efficiency. Serious incident. Injury to persons.	3	Remote	Unlikely, but possible to occur	3	Medium Risk	3-4
Minor	Nuisance. Operating limitations. Use of emergency procedures. Minor incident.	2	Improbable	Very unlikely to occur	2	Low Risk	2
Negligible	Little consequence	1	Extremely improbable	Almost inconceivable that the event will occur	1		1



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6.2 Risk evaluation

Procedure	No risk - 0	Low risk - 1 to 2	Medium risk - 3 to 4	High risk - 5
Annex 14 Runway 03	0			
Annex 14 Runway 21	0			
NDB shielding	0			
DME N shielding	0			
ILS LLZ shielding	0			
ILS DME shielding	0			
SIDs Runway 03	0			
SIDs Runway 21	0			
STARs Runway 03	0			
STARs Runway 21	0			
NDB Runway 02	0			
LOC Runway 21	0			
NDB Runway 21	0			
LNAV Runway 02	0			
LNAV/ VNAV Runway 02	0			
LPV Runway 02	0			
LNAV Runway 21	0			
LNAV/ VNAV Runway 21	0			
LPV Runway 21	0			
Visual circling	0			
Total assessed risk value	0		No risk	

The proposed Cloghercor Wind Farm does not pose a risk to flight operations at Donegal airport.

7. Conclusion

The Cloghercor Wind Farm will not affect the flight procedures at Donegal airport.

8. End of document