



Islandmore Wind Farm

Environmental Impact Assessment
Report

Annex 14.5: Special Aeronautical
Study

Islandmore Wind Farm Limited



**Islandmore Wind Turbines
Ireland West / Knock Airport
Special Aeronautical Study**



**Islandmore Wind Turbines
Ireland West / Knock Airport
Special Aeronautical Study**

0. Document Information

Document Title	Islandmore Wind Turbines, Special Aeronautical Study
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0.1.2 Document Versions

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0.1.3 Document Version Trail

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Check and final sign-off by Senior Procedure Designer*	Ian Whitworth	29.05.2024
Version 1.1		
Amended by	Ian Whitworth	04.07.2024
Version 2.1		
Document amended by procedure designer	Shahir Asharaf	15.04.2026
Check and final sign-off by Senior Procedure Designer*	Ian Whitworth	26.04.2026

** By this check, the Independent Procedure Designer confirms that the procedure has been reviewed with reasonable skill, care, and diligence in accordance with applicable criteria, including International Civil Aviation Organization Doc 8168 (PANS-OPS) and Doc 10068, and, to the best of their knowledge, complies with those criteria. IFP designs by ASAP s.r.o. are draft outputs for review and approval by the Sponsor and the competent authority and are not for operational use unless approved and published by the State, which then assumes responsibility. Third-party data used remains the responsibility of its originator. To the extent permitted by law, ASAP s.r.o.'s liability is limited to re-performance of the services or the cost thereof and excludes indirect or consequential losses.*

0.1.4 Procedure Designer Concerns

I, Shahir Asharaf, have no specific concerns and consider that all safety issues concerning the proposed Islandmore Wind Turbines are covered in this document.

0.1.5 Abbreviations Used

A/C.	Aircraft
AGL	Above Ground Level
Alt.	Altitude
Alt. Req.	Altitude Required
ARP	Aerodrome Reference Point
ATT	Along-track Tolerance
AMSL	Above Mean Sea Level
Cat.	Category
CCD	Continuous Climb Departure
CDA	Continuous Descent Approach
Cont.	Controlling
DER	Decision End of the Runway
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

ISA	International Standard Atmosphere
IWP	Intermediate Approach Waypoint
Lat.	Latitude
LOC	Localizer
Long.	Longitude
MACG	MACG
MAPt	MAPt
MHA	Minimum Holding Altitude
MOC	Minimum Obstacle Clearance
MOCA	Minimum Obstacle Clearance Altitude
MSD	Minimum Stabilization Distance
OAS	Obstacle Assessment Surface
OCA	Obstacle Clearance Altitude
PAPI	Precision Approach Path Indicator
PDG	Procedure Design Gradient
RDH	Reference Datum Height
RWY	Runway
SOC	Start of Climb
Surf.	Surface
Surf. Alt.	Surface Altitude
TAA	Terminal Arrival Altitude
TAS	True Air Speed
THR	Threshold
VFR	Visual Flight Rules
VPA	Vertical Path Angle
XTT	Cross-track Tolerance

0.1.5.1 Obstacle Assessment Tables and Abbreviations

0.1.5.1.1 Obstacle Data:

ID	Latitude	Longitude	HT	Alt.	VT

- Identification
- Latitude / Longitude
- Horizontal Tolerance
- Altitude
- Vertical Tolerance (trees/buildings)

0.1.5.1.2 Parameters Used:

Area	Distance In	Do	Dz	Dr	DCA	HL	MOC

- Obstacle protection **Area** (primary [P], secondary [S] or buffer [B]).
- **Distance** from the inner edge of the secondary area.
- **Distance** to obstacle (Do/Dz/Dr).
- **Distance** obst. Clean-up **Altitude**
- **Height Loss** applied.
- **Minimum Obstacle Clearance** applied.

0.1.5.1.3 Calculated Values:

Surf. alt.	Diff.	Ac. Alt.	Alt. Req.

- Obstacle protection **Surface altitude** at position.
- **Difference** between obstacle altitude and surface altitude.
- **Aircraft altitude** at obstacle position.
- **Altitude required** to clear obstacle.

0.1.5.1.4 Results:

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

- Minimum **Obstacle Clearance Altitude**.
- **MACG**.
- **Procedure Design Gradient**
- **Controlling** obstacle or **Not**.
- Considered **Close-in** obstacle or **Not**.
- Obstacle can be **Disregarded** in the visual segment.



**Islandmore Wind Turbines
Ireland West / Knock Airport
Special Aeronautical Study**

0.1.6

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1. General

This document details the Special Aeronautical Study that was done concerning the impact of the proposed Islandmore Wind Turbines on the flight procedures at Ireland West / Knock airport (EIKN), Ireland.

All procedures were evaluated but only the procedures that could be affected by the proposed Islandmore Wind Turbines are detailed in this document. See section 8 Appendix 1 – Procedures Checked for a full list of all procedures checked.

1.1.1 Units and Notes

- Unless otherwise specified:
 - Values are in metres.
 - Latitude / Longitude values are in WGS84.
 - Elevations are AMSL
 - Bearings are True.
 - Speeds are in knots.

2. Executive Summary

All instrument flight procedures at Ireland West / Knock airport were checked and when in operation the Islandmore Wind Turbines will not affect the flight procedures at Ireland West / Knock airport.

3. Data Used in This Study

3.1 AIP Data

Aeronautical information for Ireland West / Knock airport was extracted from the Ireland AIP (April 2026) and used in this study.

3.2 Recorded Bearings

Two systems are used in this document to record bearing information. All bearings in the “basic description” section of each segment are geodetically calculated from two Latitude / Longitude positions. These bearings are “real world” bearings and form the basis for the magnetic bearings (radials etc.) that are on the eventual chart.

Bearings in the other tables are AutoCAD bearings and depend on the datum, specifically the type of projection. These “flat earth” bearings were retained in this document so that the design of the procedure can be reproduced if required at a later date.

3.3 Proposed Positions and Altitudes

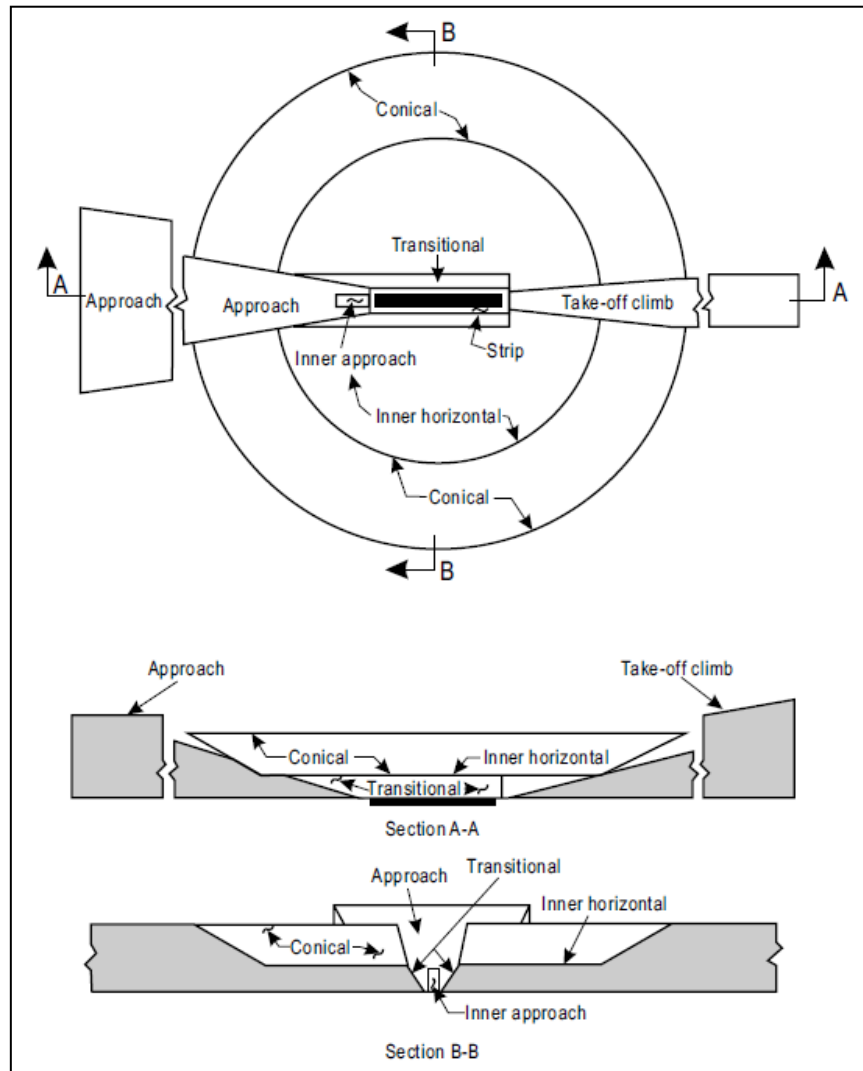
Name	Latitude	Longitude	Altitude
Position T1	53.952747	-8.58104	335
Position T2	53.952265	-8.57282	348
Position T3	53.949968	-8.56831	354
Position T4	53.944136	-8.574	306
Position T5	53.942625	-8.58001	317
Position T6	53.942305	-8.59213	304
Position T7	53.937749	-8.57554	311
Position T8	53.933808	-8.57835	300
Position T9	53.933028	-8.57237	292
Position T10	53.925705	-8.57972	293



4. ICAO Annex 14 Check

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

Obstacle limitation surfaces, Annex 14, Volume I – Aerodrome Design and Operations, Chapter 4



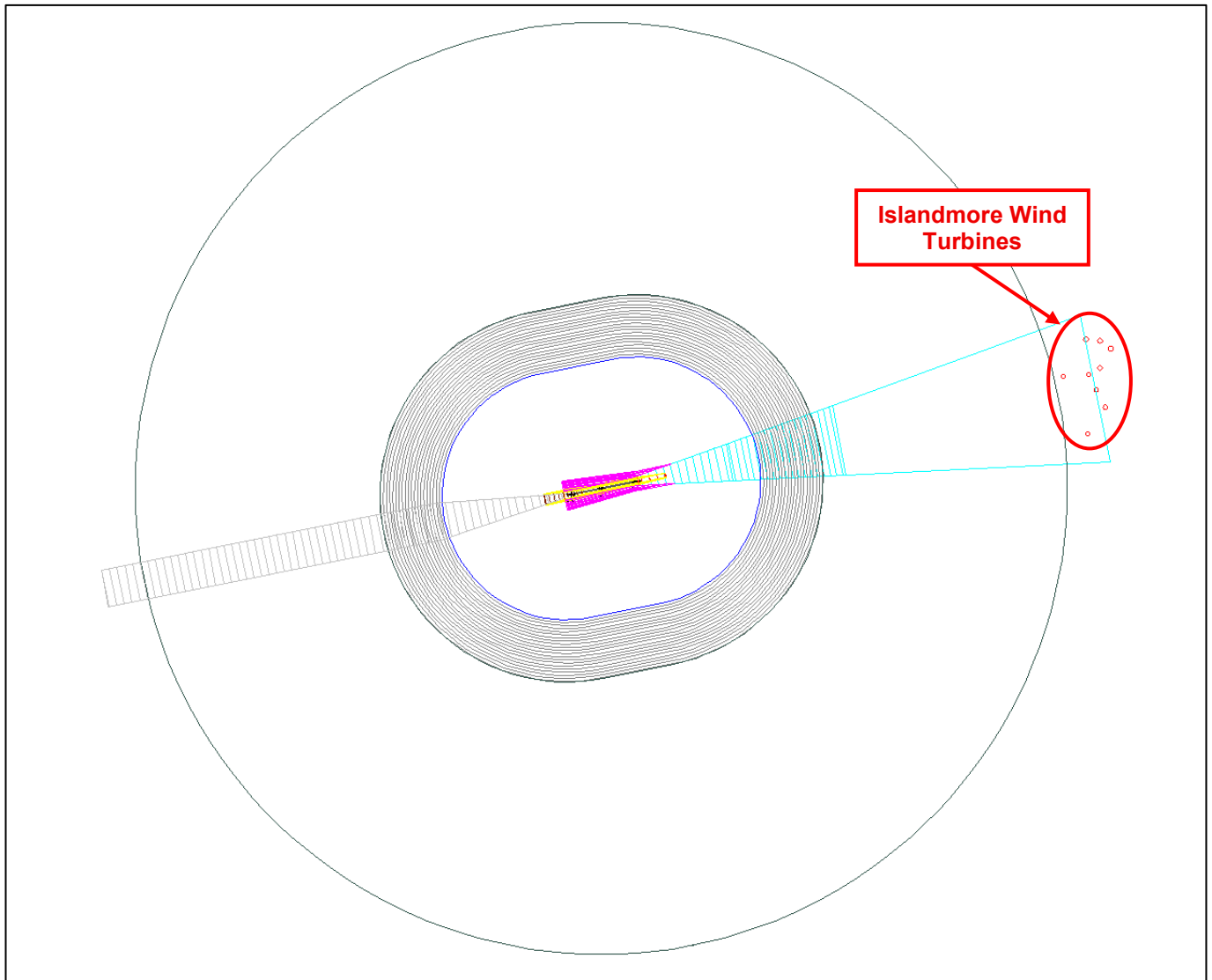
Note 2. — Objects which penetrate the obstacle limitation surfaces contained in this chapter may in certain circumstances cause an increase in the obstacle clearance altitude/height for an instrument approach procedure or any associated visual circling procedure. Criteria for evaluating obstacles are contained in Procedures for Air Navigation Services — Aircraft Operations (PANS-OPS) (Doc 8168).

4.1 Runway 26

The Annex 14 surfaces were constructed with the following parameters:

Runway	
Name	RWY26
Code	4
THR	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.69 m (665 ft)
END	
Latitude	53°54'29.79"N
Longitude	008°50'08.33"W
Altitude	180.44 m (592 ft)
CWY	
Latitude	53°54'28.84"N
Longitude	008°50'16.39"W
Altitude	180.44 m (592 ft)
Aerodrome	
Datum Elevation	RWY END
Aerodrome Reference Point (ARP)	
ID	ARP
Latitude	53°54'37.00"N
Longitude	008°49'07.00"W
Altitude	202.69 m (665 ft)
Code Letter 'F'	No
Approach Surface	
Length of Inner Edge	300 m
Distance From RWY THR	60 m
Divergence (each side)	15 %
First Section Length	3000 m
First Section Slope	2 %
Second Section Length	3600 m
Second Section Slope	2.5 %
Horizontal Section Length	8400 m
Total Length	15000 m

Balked Landing Surface	
Length of Inner Edge	120 m
Distance From RWY THR	End of strip 1800 m
Divergence (each side)	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	
Location	END positions
Height	45 m
Radius	4000 m
Inner Transitional Surface	
Slope	33.3 %
Outer Horizontal Surface	
Height	150 m
Radius	15000 m
Strip Surface	
Width	150 m
Length	60 m
Take-off Surface	
Length of Inner Edge	180 m
Distance From RWY END	CWY / exactly 60 m
Divergence (each side)	12.5 %
Final Width	1200 m
Length	15000 m
Slope	2 %
Transitional Surface	
Slope	14.3 %



As can be seen in the previous picture the proposed Islandmore Wind Turbines are situated within the Annex 14 Approach surface.

Approach surface assessment

ID	Alt.	Surf. alt.	Diff.	Cont.
Position T1	335.0	352.7	-17.7	No

As can be seen in the previous table the proposed Islandmore Wind Turbines are below the Approach surface.

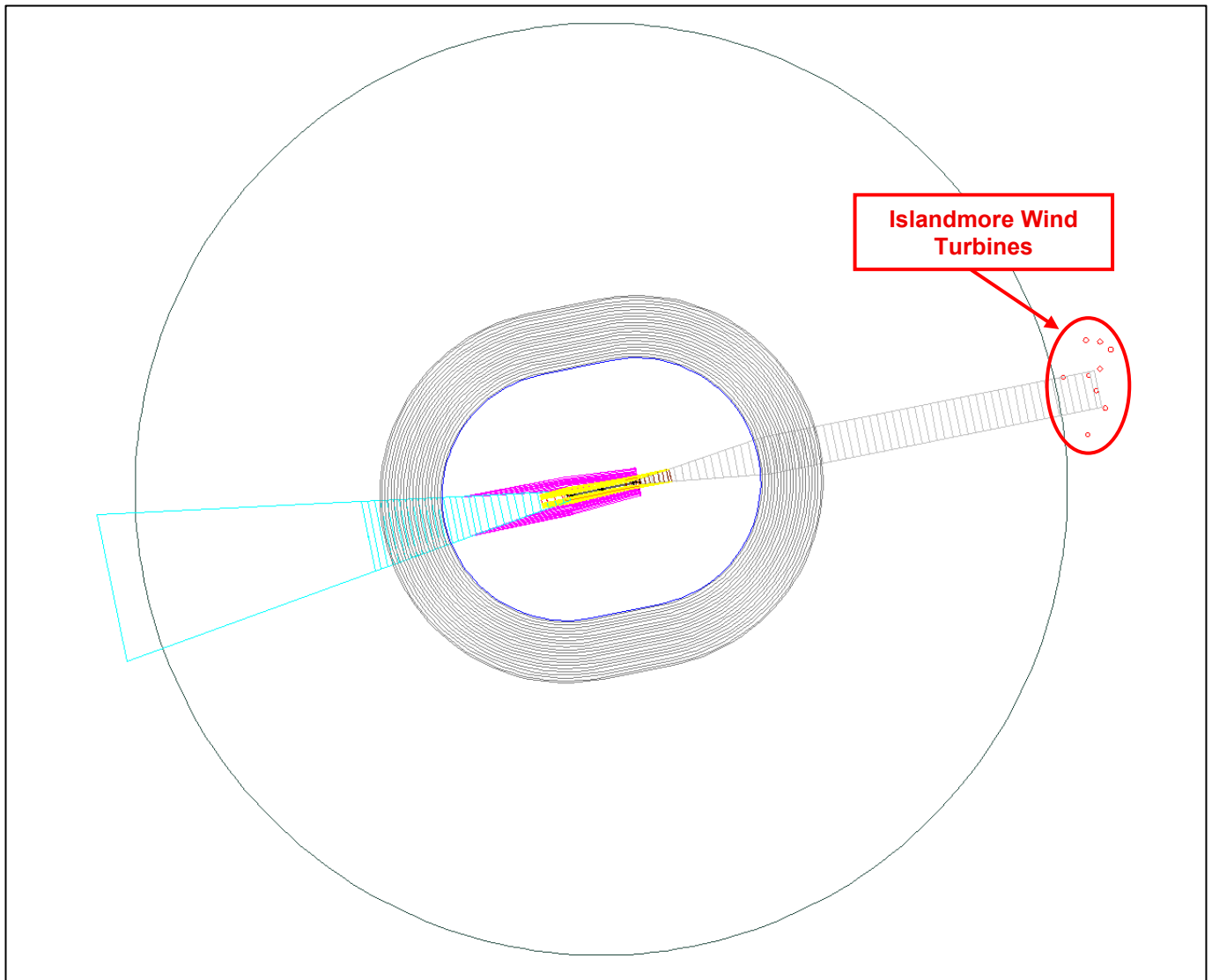
The Annex 14 surfaces for Ireland West / Knock airport runway 26 are not affected by the Proposed Islandmore Wind Turbines.

4.2 Runway 08

The Annex 14 surfaces were constructed with the following parameters:

Runway	
Name	RWY08
Code	4
START	
Latitude	53°54'29.79"N
Longitude	008°50'08.33"W
Altitude	180.44 m (592 ft)
THR	
Latitude	53°54'30.72"N
Longitude	008°50'00.46"W
Altitude	180.44 m (592 ft)
END	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.69 m (665 ft)
CWY	
Latitude	53°54'45.25"N
Longitude	008°47'56.93"W
Altitude	202.69 m (665 ft)
Aerodrome	
Datum Elevation	RWY THR
Aerodrome Reference Point (ARP)	
ID	ARP
Latitude	53°54'37.00"N
Longitude	008°49'07.00"W
Altitude	202.69 m (665 ft)
Code Letter 'F'	No
Approach Surface	
Length of Inner Edge	300 m
Distance From RWY THR	60 m

Divergence (each side)	15 %
First Section Length	3000 m
First Section Slope	2 %
Second Section Length	3600 m
Second Section Slope	2.5 %
Horizontal Section Length	8400 m
Total Length	15000 m
Conical Surface	
Slope	5 %
Height	100 m
Inner Horizontal Surface	
Location	Runway START
Height	45 m
Radius	4000 m
Outer Horizontal Surface	
Height	150 m
Radius	15000 m
Strip Surface	
Width	150 m
Length	60 m
Take-off Surface	
Length of Inner Edge	180 m
Distance From RWY END	CWY / exactly 60 m
Divergence (each side)	12.5 %
Final Width	1200 m
Length	15000 m
Slope	2 %
Transitional Surface	
Slope	14.3 %



As can be seen in the previous picture the proposed Islandmore Wind Turbines are situated within the Annex 14 Take-off surface.

Take-off surface assessment

ID	Alt.	Surf. alt.	Diff.	Cont.
Position T6	304.0	482.6	-178.6	No

As can be seen in the previous table the proposed Wind Turbines are below the Take-off surface.

The Annex 14 surfaces for Ireland West / Knock airport runway 08 are not affected by the proposed Islandmore Wind Turbines.

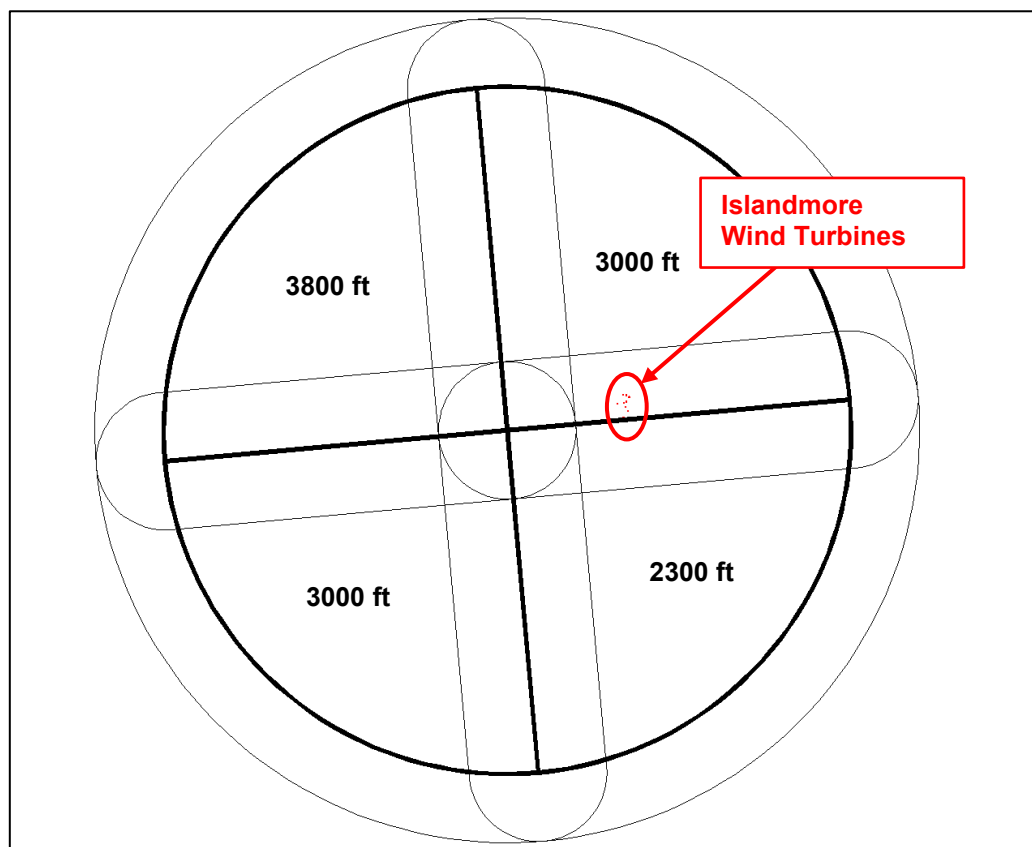
5. Flight procedure issues

The Instrument flight procedures for Ireland West / Knock airport were obtained from the Ireland Aeronautical Information Publication (AIP). The following pages detail the analysis of each of these procedures.

5.1 Minimum Sector Altitudes (MSA)

The four MSAs were designed and assessed.

5.1.1 MSA located at EIKN ARP



As can be seen in the previous picture, the proposed Islandmore Wind Turbines are situated within the 356.76° (T) - 086.76° (T) and 086.76° (T) - 176.76° (T) sectors of the EIKN ARP MSA.

Assessment - 356.76° (T) - 086.76° (T)

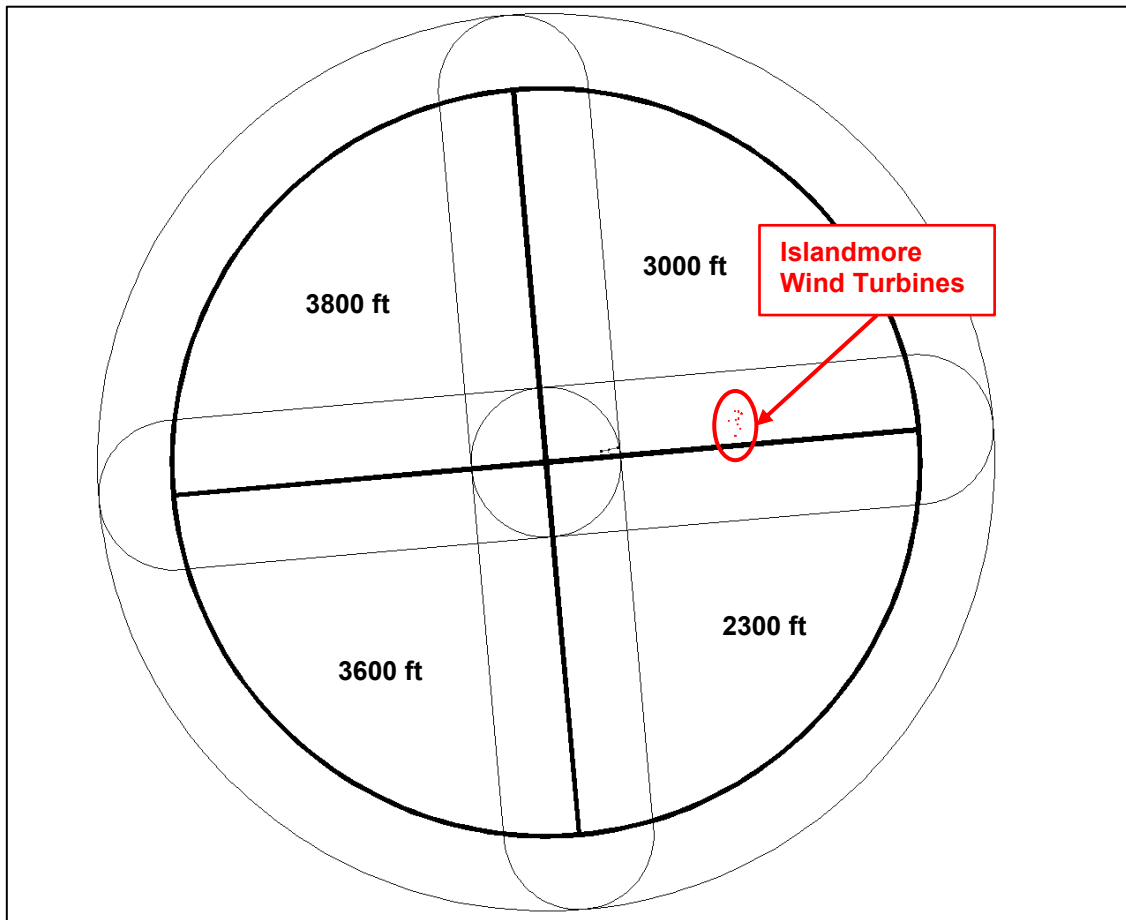
ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	3000

Assessment - 086.76° (T) - 176.76° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	2300

As can be seen in the previous tables, the EIKN ARP MSA is not affected by the proposed Islandmore Wind Turbines.

5.1.2 MSA located at KNK NDB



As can be seen in the previous picture, the proposed Islandmore Wind Turbines are situated within the 355° (T) - 085° (T) and 085° (T) - 175° (T) sectors of the NDB KNK MSA.

Assessment - 355° (T) - 085° (T)

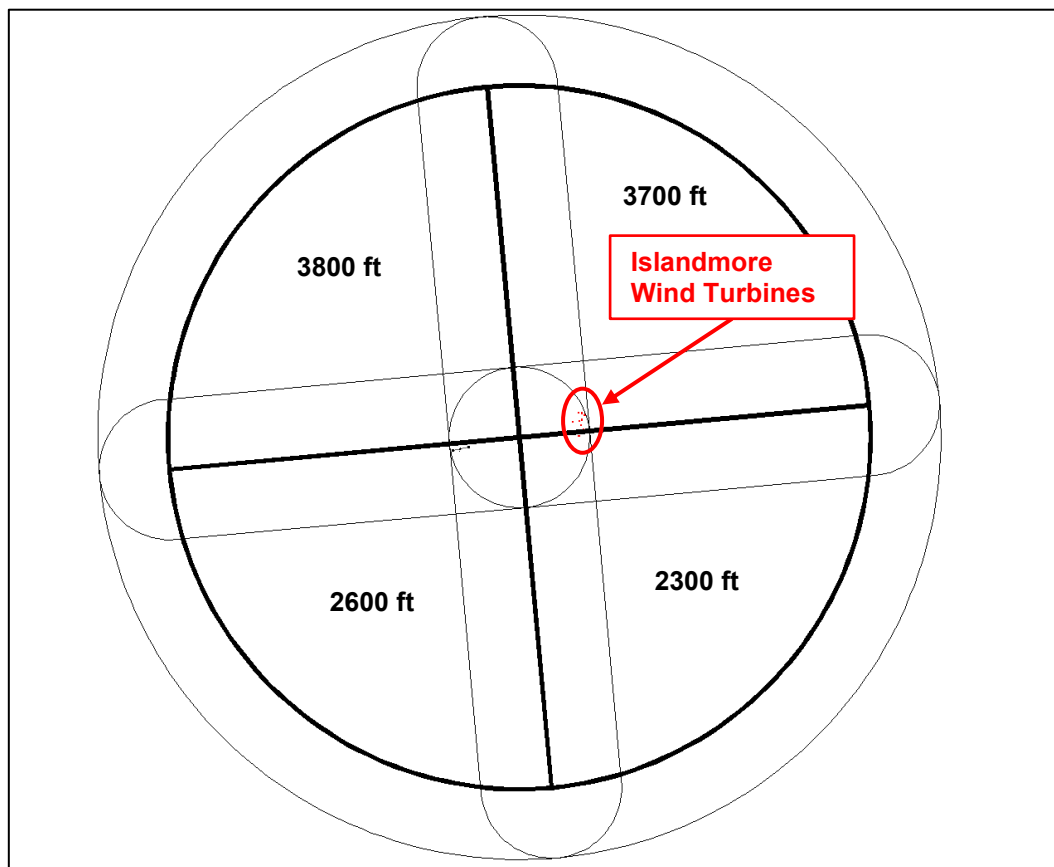
ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	3000.0

Assessment - 085° (T) - 175° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	2300.0

As can be seen in the previous tables, the NDB KNK MSA is not affected by the proposed Islandmore Wind Turbines.

5.1.3 MSA located at OK NDB



As can be seen in the previous picture, the proposed Islandmore Wind Turbines are situated within all the NDB OK MSA Sectors.

Assessment - 355° (T) - 085° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	3700.0

Assessment - 085° (T) - 175° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	2300.0

Assessment - 175° (T) - 265° (T)

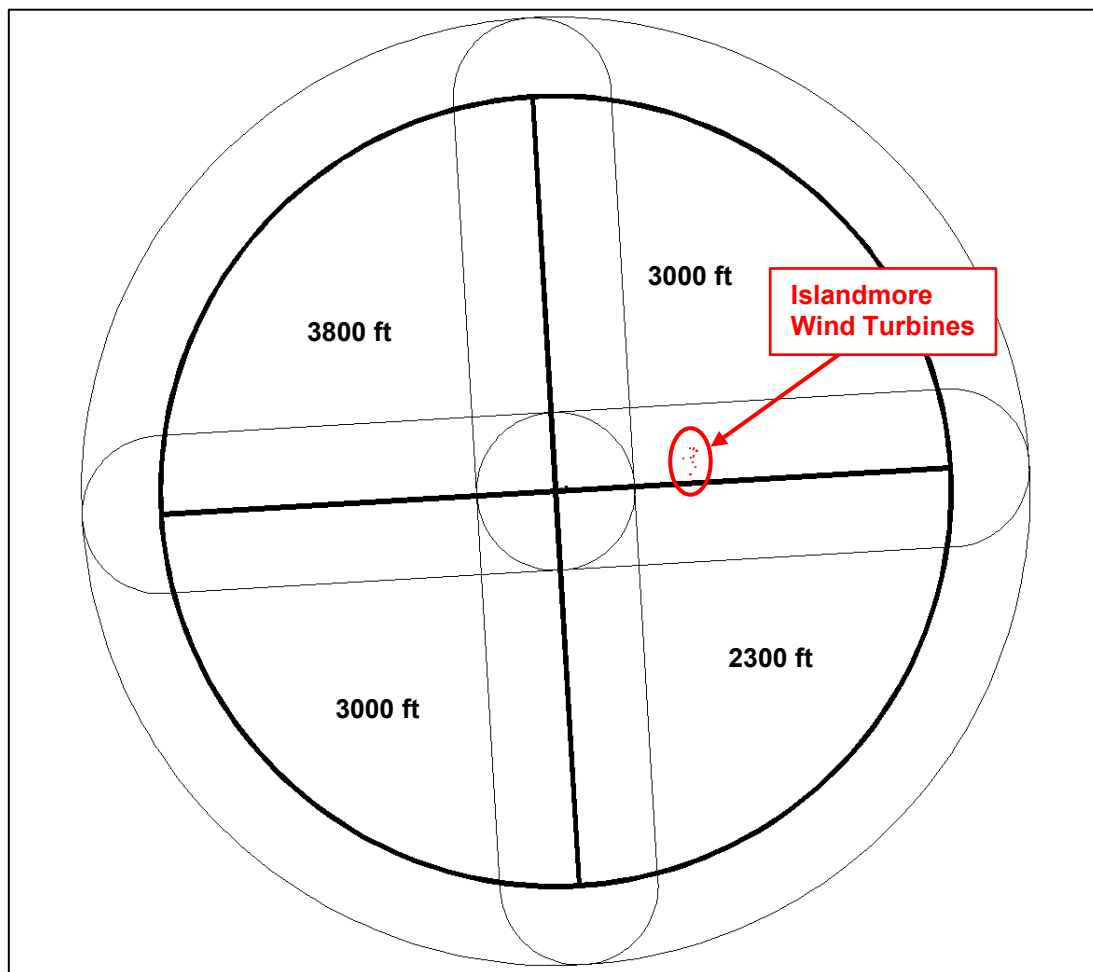
ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	2600.0

Assessment - 265° (T) - 355° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	3800.0

As can be seen in the previous tables, the NDB OK MSA is not affected by the proposed Islandmore Wind Turbines.

5.1.4 MSA located at CON VOR



As can be seen in the previous picture, the proposed Islandmore Wind Turbines are situated within the 357.49° (T) - 086.9° (T) and 086.9° (T) - 177.44° (T) sectors of the VOR CON MSA.

Assessment - 357.49° (T) - 086.9° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	3000.0

Assessment - 086.9° (T) - 177.44° (T)

ID	Alt.	MOC	Required MOCA (ft)	Published MOCA (ft)
Position T3	357.0	300.0	2155.6	2300.0

As can be seen in the previous tables, the VOR CON MSA is not affected by the proposed Islandmore Wind Turbines.

None of the MSAs are affected by the proposed Islandmore Wind Turbines.

5.2 Holding Patterns

The minimum holding altitude is 2200 ft.

Minimum Holding Pattern Altitude (ft)	2200
Wind turbine Elevation (m)	357
MOC required (m)	300
MOC achieved (m)	313.6
Controlling	No

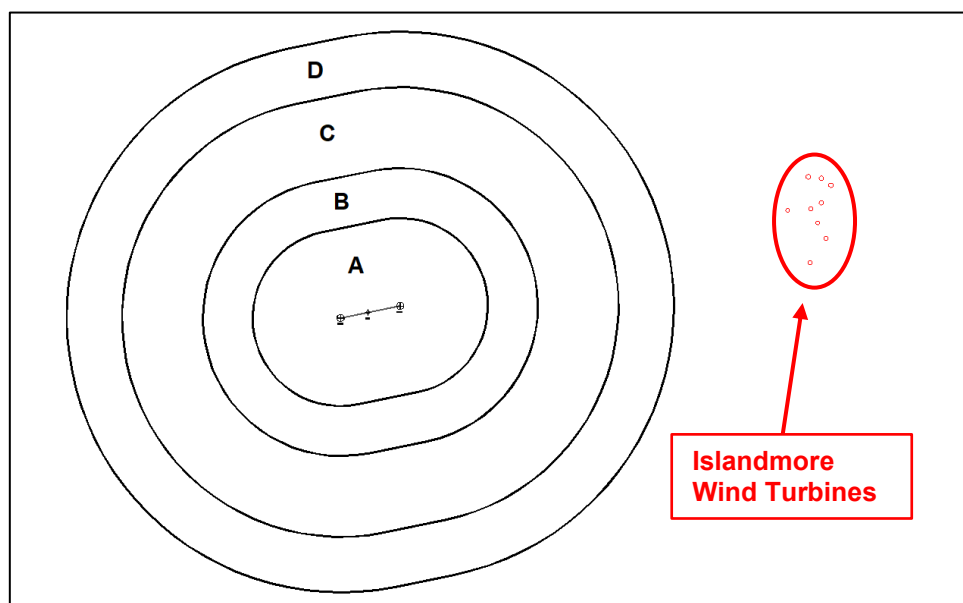
As can be seen in the previous table the holding patterns are not affected by the proposed Islandmore Wind Turbines.

5.3 Visual Circling (VMC)

The visual circling was constructed with the following parameters:

Thresholds	
Position	
ID	THR08
Latitude	53°54'30.72"N
Longitude	008°50'00.46"W
Altitude	180.44 m (592 ft)
Position	
ID	THR26
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.69 m (665 ft)
Parameters	
ISA	15 °C

Category A	
Altitude	1700 ft
MOC	90 m
IAS	100 kts
Category B	
Altitude	1700 ft
MOC	90 m
IAS	135 kts
Category C	
Altitude	1700 ft
MOC	120 m
IAS	180 kts
Category D	
Altitude	1700 ft
MOC	120 m
IAS	205 kts

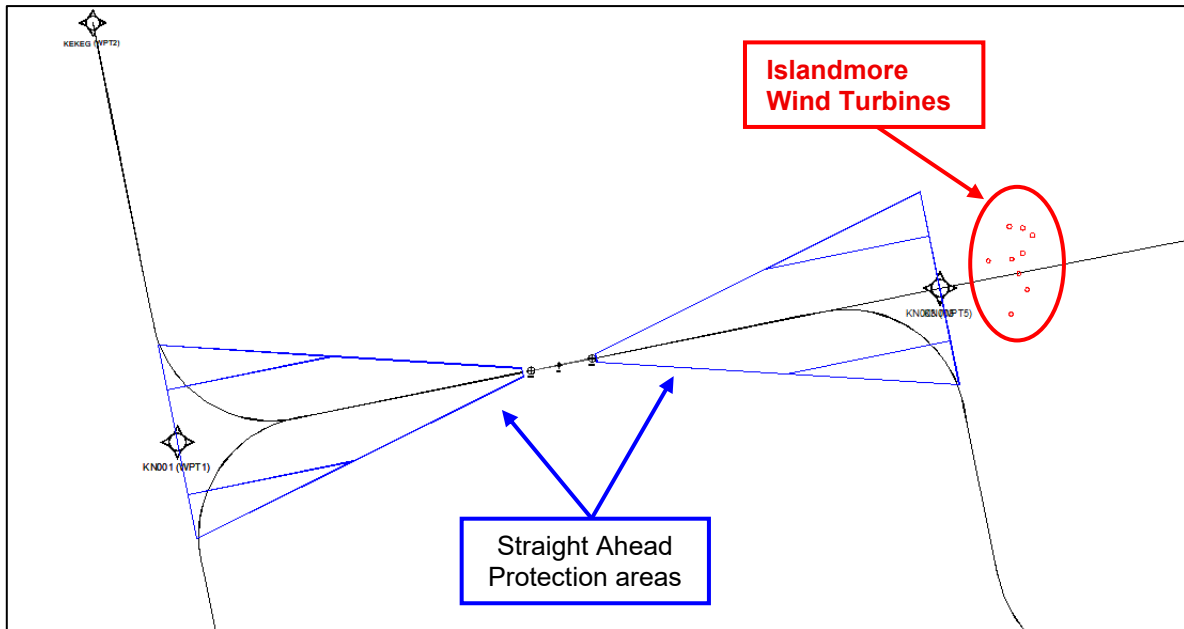


As can be seen in the previous picture the VMC for Ireland West / Knock airport is not affected by the proposed Islandmore Wind Turbines.

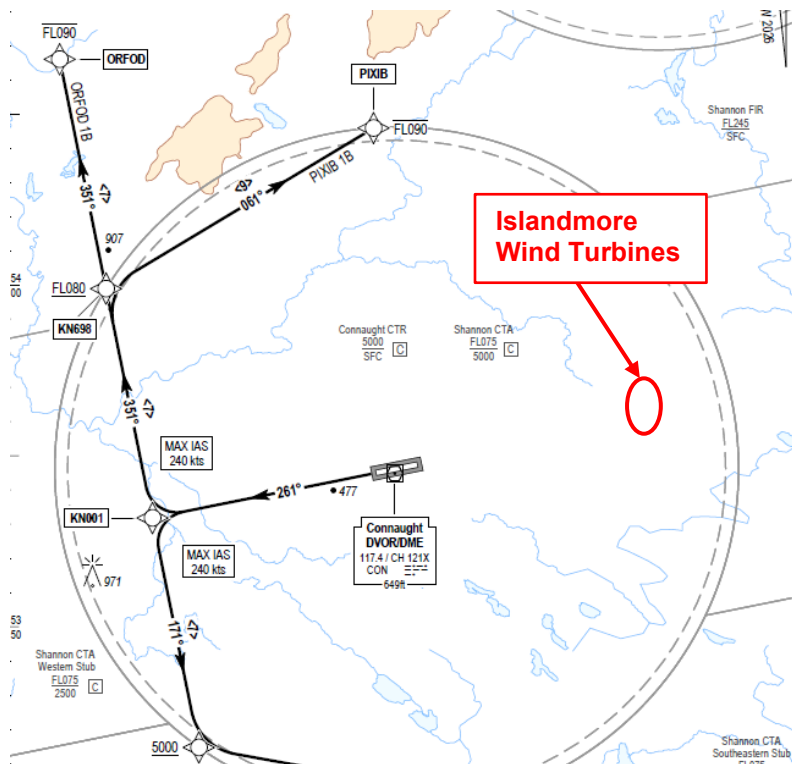
5.4 Departures

5.4.1 Straight Ahead Area

As can be seen in the previous diagram, the proposed Islandmore Wind Turbines are not within the straight obstacle protection areas for the departures at Ireland West airport. Therefore, no further checking of the straight departure areas is required.



5.4.2 Area After the Turn – runway 26

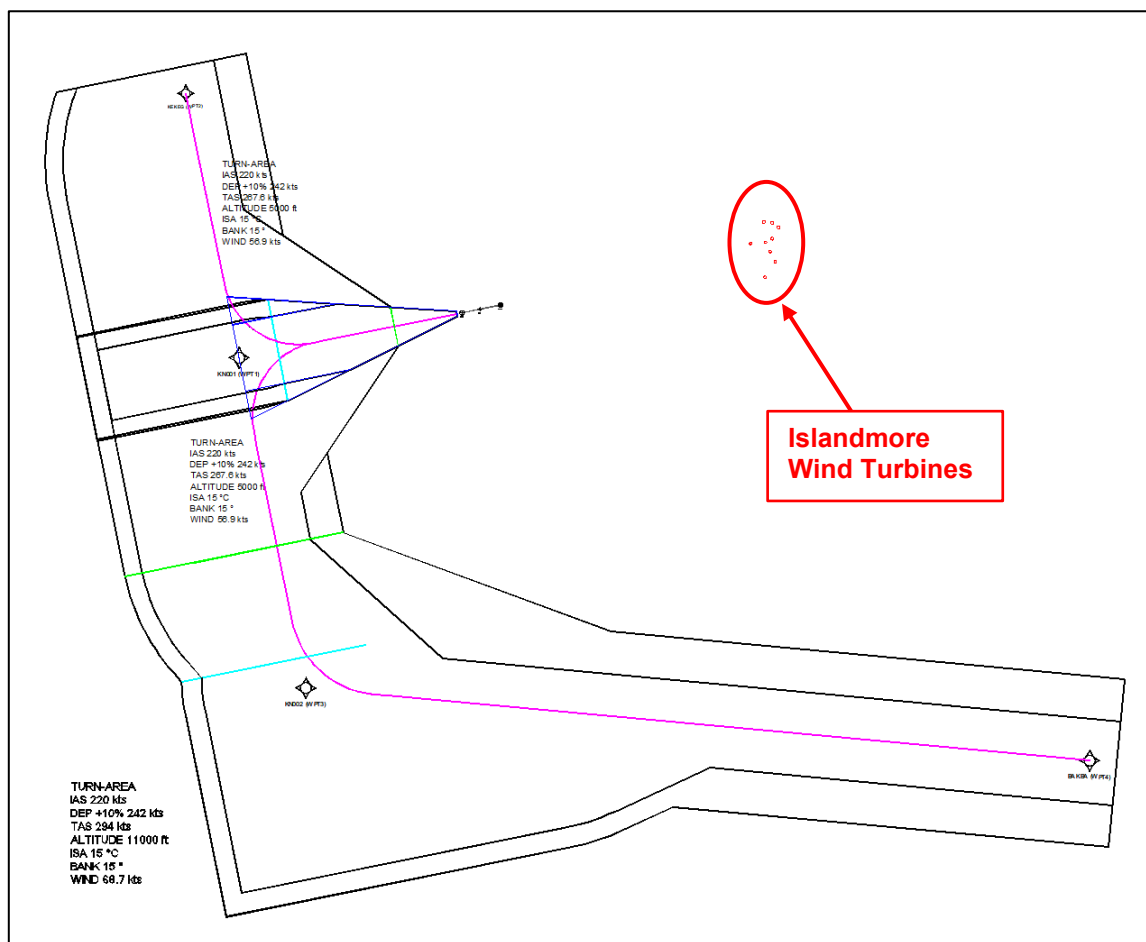


The RNAV departure protection area was constructed with the following parameters:

Runway	
DER Position	
ID	CWY26
Latitude	53°54'28.84"N
Longitude	008°50'16.39"W
Altitude	180.44 m (592 ft)
Direction	263 °
Parameters	
Aerodrome Reference Point (ARP)	
ID	ARP
Latitude	53°54'37.00"N
Longitude	008°49'07.00"W

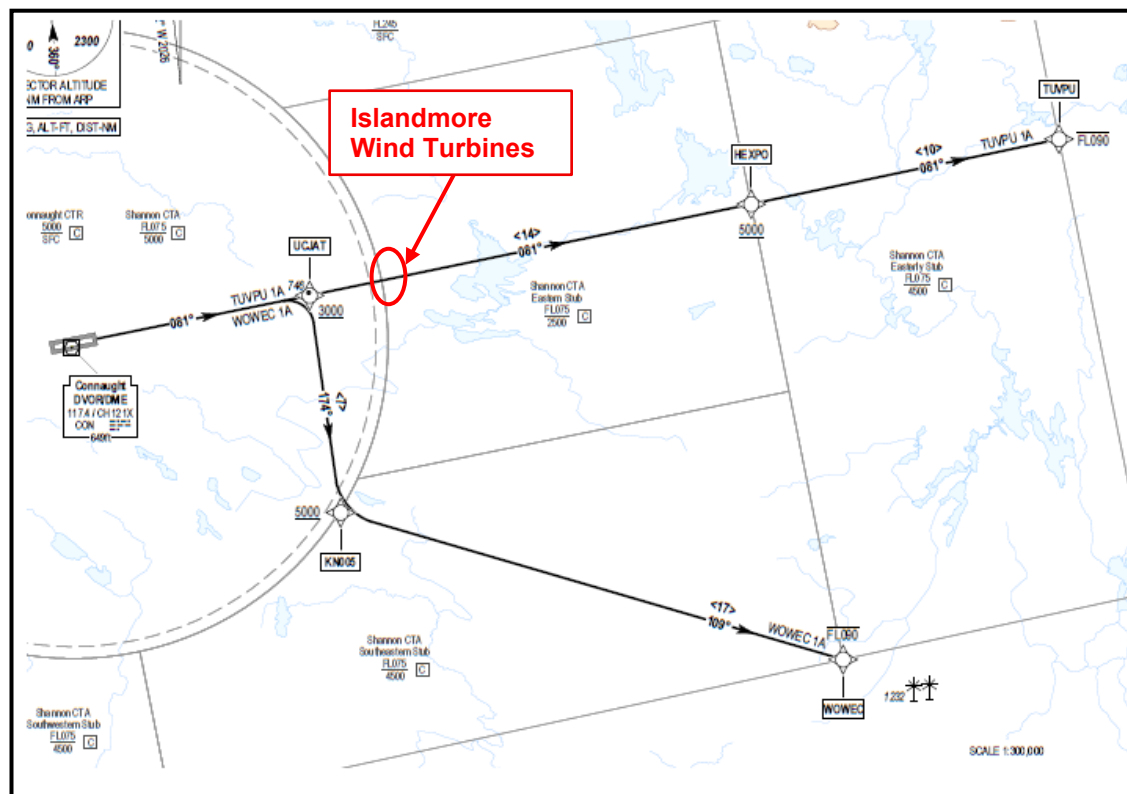
1st Waypoint Position	
ID	KN001
Latitude	53°53'11.11"N
Longitude	009°01'11.50"W
Sensor Type	GNSS
RNAV Specification	RNAV 1
Cat. H	No
MOC	0.8 %
PDG	3.3 %

As can be seen in the previous diagram the proposed Islandmore Wind Turbines are situated outside the RNAV departure protection area.



The Standard Instrument Departures (SIDs) from runway 26 are not affected by the proposed Islandmore Wind Turbines.

5.4.3 Area After the Turn – runway 08



The RNAV departure protection area was constructed with the following parameters:

Straight ahead:

Starting Position	
ID	CWY (TODA END)
Latitude	53°54'45.25"N
Longitude	008°47'56.94"W
Finishing Position	
ID	ETP before UCJAT
Latitude	53°55'57.10"N
Longitude	008°37'43.54"W
Calculation	Ellipsoid
Bearing (T)	078.71 °
Distance	6.16 nm / 11.41 km



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TUVPU A:

Turn 1 (UCJAT)

Tolerances - UCJAT	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm
Tolerances - HEXPO	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2.5 nm

Turn 2 (HEXPO)

Tolerances - HEXPO	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2.5 nm
Tolerances - TUVPU	
ATT	1.6 nm
XTT	2 nm
Area Semi Width	5 nm

WOWEC A:

Turn 1 (UCJAT)

Waypoint	
Type	Fly-By
ID	UCJAT
Latitude	53°56'06.36"N
Longitude	008°36'23.84"W
Track TO	078.71 °
Track FROM	172.19 °
Course Change	093.32 °
Turn	Right
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm

Nominal Turn	
IAS	275 kts
Altitude	3500 ft
ISA VAR	15 °C
Bank°	25 °
TAS	297.3 kts
r	5114.27 m
Roll-in Distance (L2)	764.61 m
Turn Init.(L1)	5419.94 m
Roll-out Distance (L2)	764.61 m
MSD	6184.56 m

Turn Protection Area	
IAS	250 kts
IAS + 10%	275 kts
Altitude	5000 ft
ISA VAR	15 °C
Bank°	15 °
Wind	30 kts
TAS	304.1 kts
r	9316.95 m
E	1443.6 m
$\sqrt{r^2 + E^2}$	9428.12 m
r + E	10760.55 m
r + 2E	12204.15 m

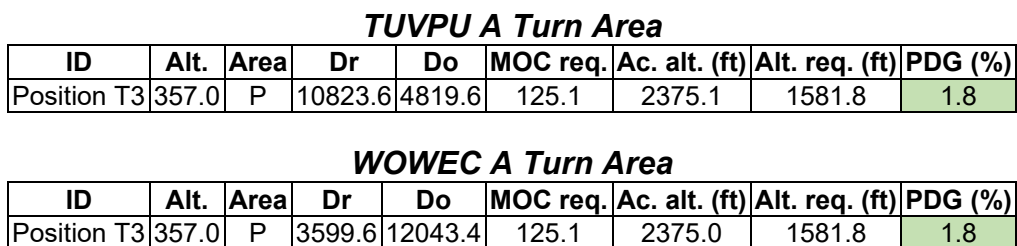
Turn 2 (KN005)

Waypoint	
Type	Fly-By
ID	KN005
Latitude	53°49'13.15"N
Longitude	008°34'48.02"W
Track TO	172.19 °
Track FROM	106.61 °
Course Change	065.6 °
Turn	Left
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2 nm

Nominal Turn	
IAS	275 kts
Altitude	6300 ft
ISA VAR	15 °C
Bank°	25 °
TAS	310.3 kts
r	5572.48 m
Roll-in Distance (L2)	798.13 m
Turn Init.(L1)	3591.27 m
Roll-out Distance (L2)	798.13 m
MSD	4389.4 m

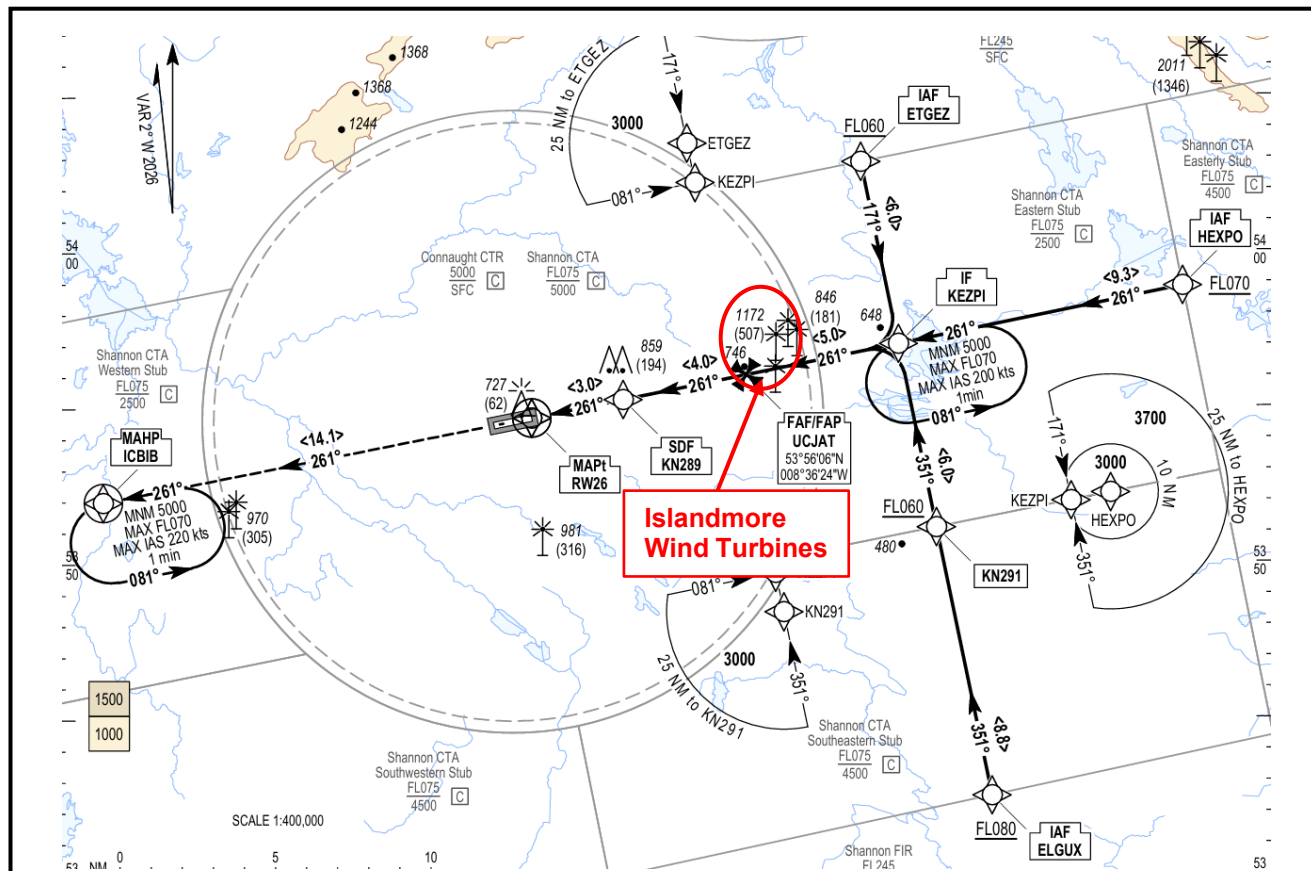
Turn Protection Area	
IAS	250 kts
IAS + 10%	275 kts
Altitude	9300 ft
ISA VAR	15 °C
Bank°	15 °
Wind	30 kts
TAS	325.2 kts
r	10652.38 m
E	1543.59 m
$\sqrt{r^2 + E^2}$	10763.63 m
r + E	12195.97 m
r + 2E	13739.57 m

As can be seen in the following picture, the proposed Islandmore Wind Turbines are situated inside the protection areas related to the TUVPU A and the WOWEC A SIDs.

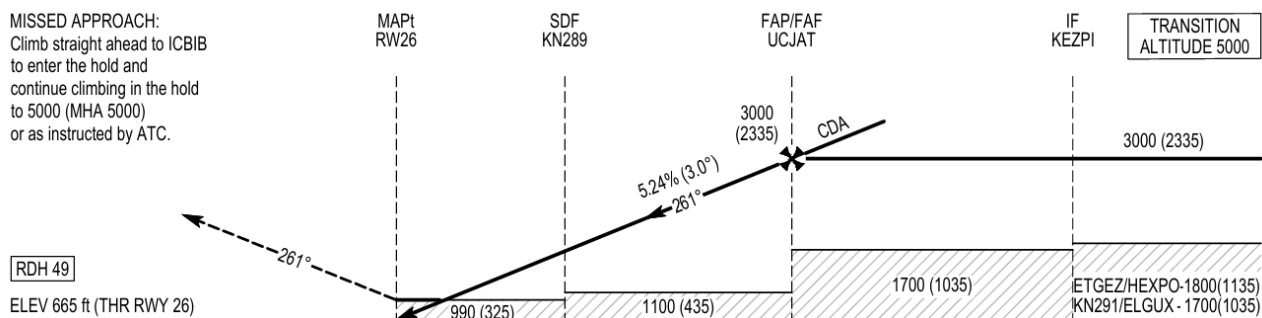


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5.5 RNP Runway 26



MISSED APPROACH:
Climb straight ahead to ICBIB
to enter the hold and
continue climbing in the hold
to 5000 (MHA 5000)
or as instructed by ATC.



OCA (H)	A	B	C	D
LNAV	990 (325)			
LNAV / VNAV	920 (255)			
LPV	865 (200)			
Visual Manoeuvring (Heights AAL)	1060 (395)	1160 (495)	1260 (595)	1380 (715)

5.5.1 LNAV and LNAV/VNAV Approach

The LNAV approach to this runway was calculated using the following parameters:

Intermediate Approach

Starting Position	
ID	KEZPI
Latitude	53°57'04.67"N
Longitude	008°28'05.88"W
Finishing Position	
ID	UCJAT
Latitude	53°56'06.36"N
Longitude	008°36'23.84"W
Result	
Forward True Bearing	258.83 °
Distance Between Positions	5.00 nm / 9.26 km

Intermediate Approach - Protection Areas

Tolerances - KEZPI	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2.5 nm
Tolerances - UCJAT	
ATT	0.24 nm
XTT	0.3 nm
Area Semi Width	1.45 nm

Final Approach

Starting Position	
ID	UCJAT
Latitude	53°56'06.36"N
Longitude	008°36'23.84"W
Finishing Position	
ID	RW26
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Result	
Forward True Bearing	258.86 °
Distance Between Positions	7.04 nm / 13.04 km

Final Approach - Protection Areas

Tolerances - UCJAT	
ATT	0.24 nm
XTT	0.3 nm
Area Semi Width	1.45 nm
Tolerances - RW26	
ATT	0.24 nm
XTT	0.3 nm
Area Semi Width	0.95 nm

Missed Approach (Initial Phase)

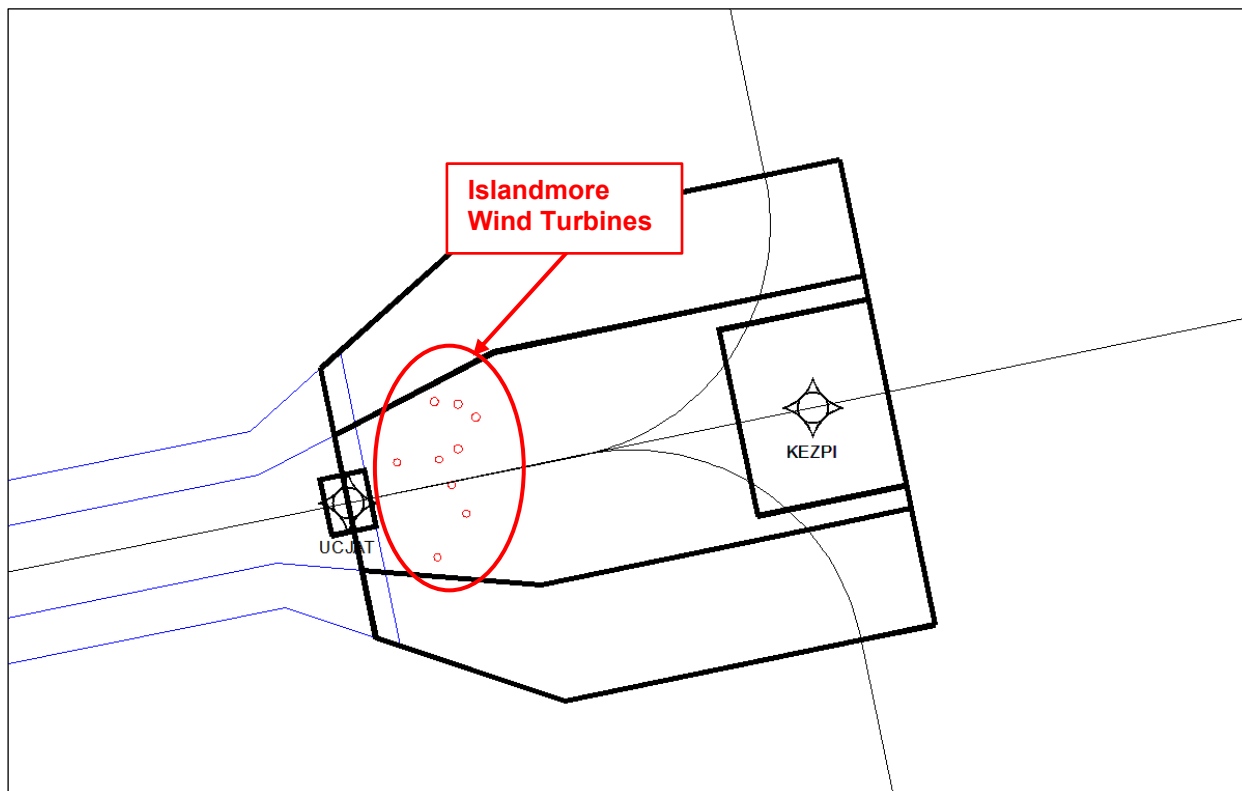
Starting Position	
ID	RW26
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Finishing Position	
ID	SOC
Latitude	53°54'29.87"N
Longitude	008°50'09.07"W
Result	
Forward True Bearing	258.86 °
Distance Between Positions	1.25 nm / 2.31 km

The position of the SOC was calculated using the following parameters:

Parameters	
IAS	185 kts
Altitude	665.18 ft
ISA VAR	15 °C
Results	
TAS	191.6 kts
X (10 kts / 15 s)	1555.98 m
d (10 kts / 3 s)	311.2 m

Missed Approach (Intermediate Phase)

Starting Position	
ID	SOC
Latitude	53°54'29.87"N
Longitude	008°50'09.07"W
Finishing Position	
ID	ICBIB
Latitude	53°51'59.32"N
Longitude	009°11'23.53"W
Result	
Forward True Bearing	258.84 °
Distance Between Positions	12.82 nm / 23.74 km



As can be seen in the previous picture the proposed Islandmore Wind Turbines are situated within the intermediate segment of the LNAV and LNAV/VNAV approach procedures for runway 26.

Intermediate segment assessment

ID	Alt.	Area	MOC	MOCA required (ft)	MOCA Published (ft)
Position T3	357.0	P	150.0	1663.4	1700.0

The LNAV and LNAV/VNAV approach procedures for runway 26 are not affected by the proposed Islandmore Wind Turbines.

5.5.2 LPV 200 Approach

The LPV 200 approach to this runway was calculated using the following parameters:

Intermediate Approach

Starting Position	
ID	KEZPI
Latitude	53°57'04.67"N
Longitude	008°28'05.88"W
Finishing Position	
ID	FAP
Latitude	53°56'06.12"N
Longitude	008°36'23.49"W
Parameters	
Calculation Type	Ellipsoid
Result	
Forward True Bearing	258.78 °
Distance Between Positions	5.00 nm / 9.26 km

Intermediate Approach – Protection Areas

Tolerances - KEZPI	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2.5 nm
Tolerances - FAP	
ATT	0.24 nm
XTT	0.3 nm
Area Semi Width	1.45 nm

APV I OAS

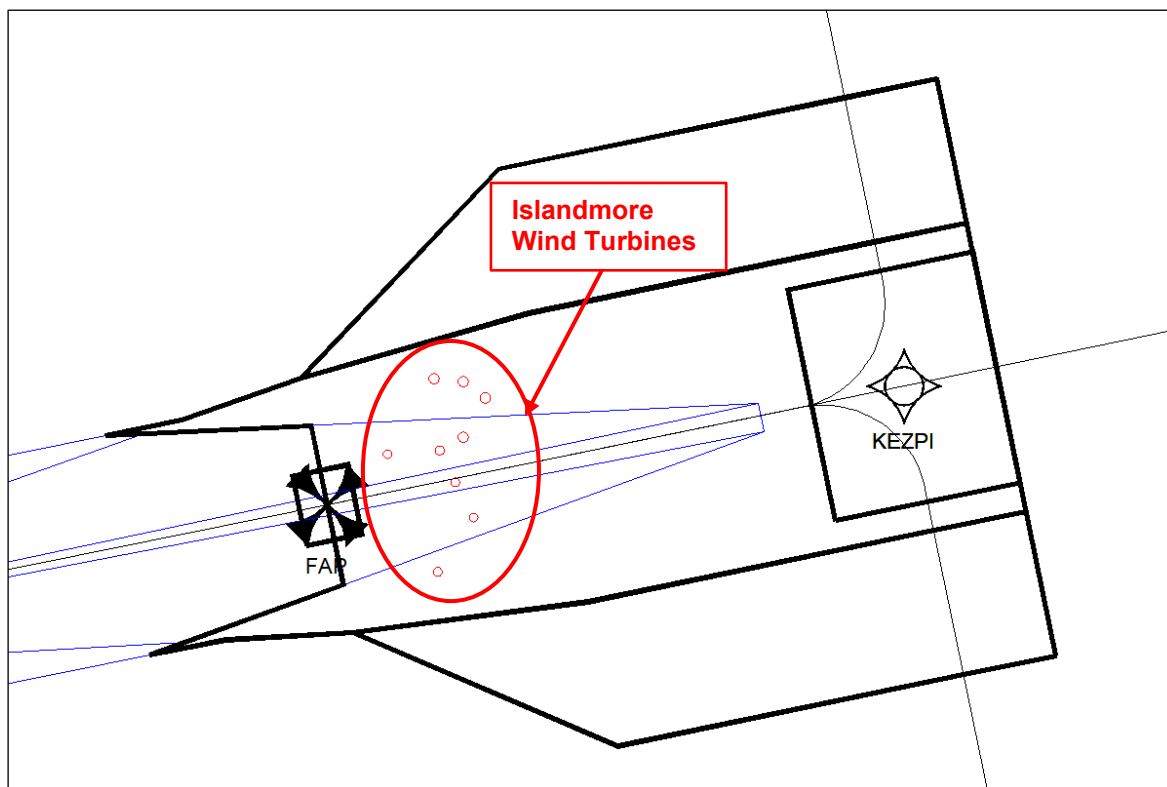
Starting Position	
ID	FAP
Latitude	53°56'06.12"N
Longitude	008°36'23.49"W
Finishing Position	
ID	THR26
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W

Parameters	
Calculation Type	Ellipsoid
Result	
Forward True Bearing	258.90 °
Distance Between Positions	7.04 nm / 13.05 km

APV I OAS – Protection Areas

Threshold Position	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.75 m (665.18 ft)
Input Parameters	
In-bound Track	258.90 °
Preceding Segment Minimum Altitude	3000.1 ft
Preceding Segment MOC	150 m
Category	SBAS CAT I
Glide Path Angle	3 °
MA Climb Gradient	2.5 %
RDH at THR	49 ft
Course Width at LTP/FTP	210 m
GARP to THR Distance	2603.87 m
Aircraft Category	A
Height Loss	40 m (131.23 ft)
Height Loss Correction	0 m (0 ft)
Wing Semi Span	30 m
Wheel Height	6 m
Missed Approach Evaluation Method	XE datum (std.)
Earth Radius	6367444.66 m
Calculated Parameters	
Xe	900 m
FAP Distance	7.04 nm
SOC Distance	762.8 m past the threshold

	A	B	C
W	0.028500		-8.07
X	0.026960	0.177747	-16.35
Y	0.023233	0.203782	-20.93
Z	-0.025000		-22.50



Intermediate segment assessment

ID	Alt.	Area	MOC	MOCA required (ft)	MOCA Published (ft)
Position T3	357.0	P	150	1663.4	1700

OAS assessment

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T7	311.0	W	621.9	-310.9	No
Position T10	300.0	X1	657.6	-357.6	No
Position T8	292.0		696.1	-404.1	No
Position T5	317.0	X2	660.7	-343.7	No
Position T4	340.0		693.9	-353.9	No
Position T6	304.0		660.4	-356.4	No

The LPV 200 approach procedure for runway 26 is not affected by the proposed Islandmore Wind Turbines.

5.6 Instrument Landing System (ILS) Assessment

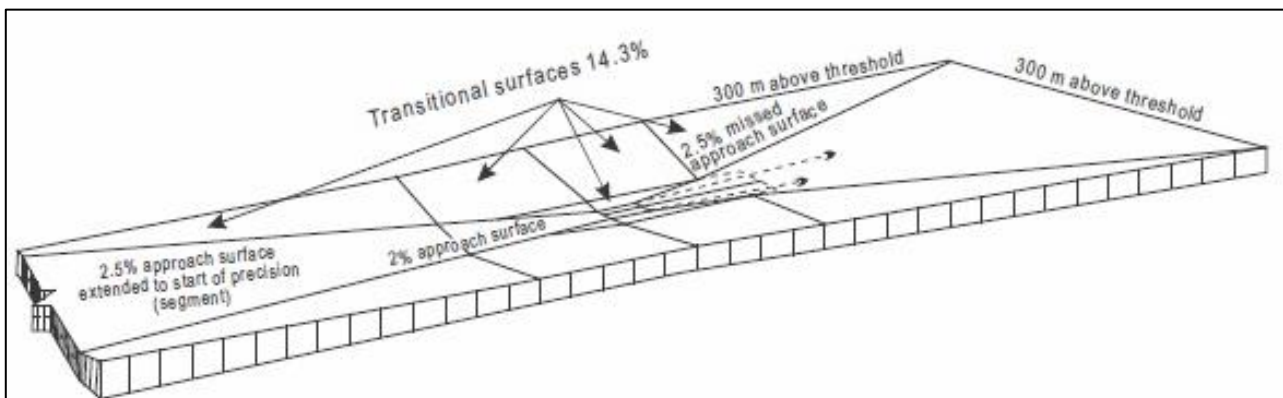
PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5 - "General" states the following:

"Three methods of calculating OCA/H are presented, which involve progressive increases in the degree of sophistication in the treatment of obstacles."

5.6.1 Basic ILS Surfaces

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5.2 "First method" states:

*"The **first** method involves a set of surfaces derived from the Annex 14 precision approach obstacle limitation surfaces and a missed approach surface..."*



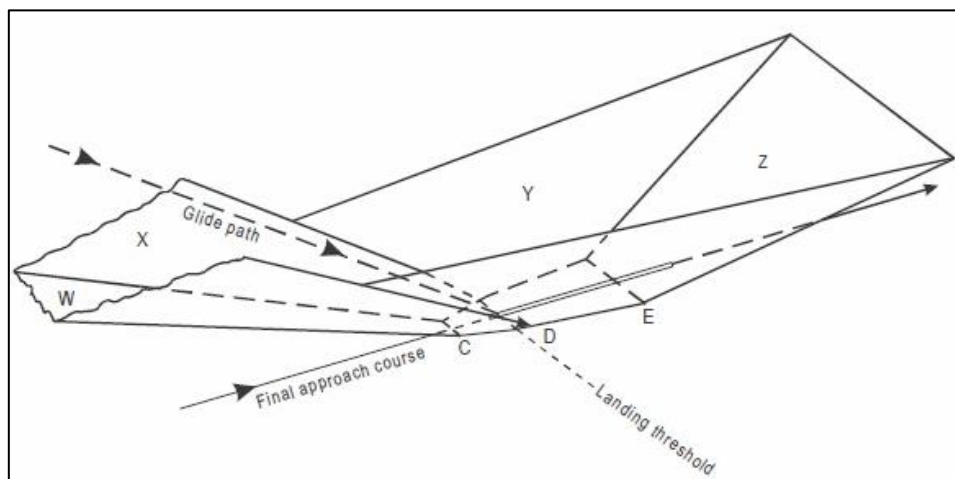
ILS Basic Surfaces

Basic ILS surfaces is the simplest form of ILS protection and is rarely used.

5.6.2 Obstacle Assessment Surfaces (OAS)

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5.3 "Second method" states:

"The second method involves a set of obstacle assessment surfaces (OAS) above the basic ILS surfaces..."



The Approach Funnel (OAS)

The Airport Services Manual (Document 9137), Part 6 - Control of Obstacles, Chapter 1 - Surfaces, paragraph 1.3.3 Obstacle assessment surfaces states:

"The obstacle assessment surfaces (OAS) establish a volume of airspace, inside which it is assumed the flight paths of aeroplanes making ILS approaches and subsequent missed approaches will be contained with sufficiently high probability.

....
The lateral boundaries of the funnel represent estimates of the maximum divergence of an aeroplane from Runway centre line during the approach and missed approach so that the probability of an aeroplane touching the funnel at any one point is $1:10^{-7}$ or less."

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.4.8.4 Definition of obstacle assessment surfaces (OAS) states:

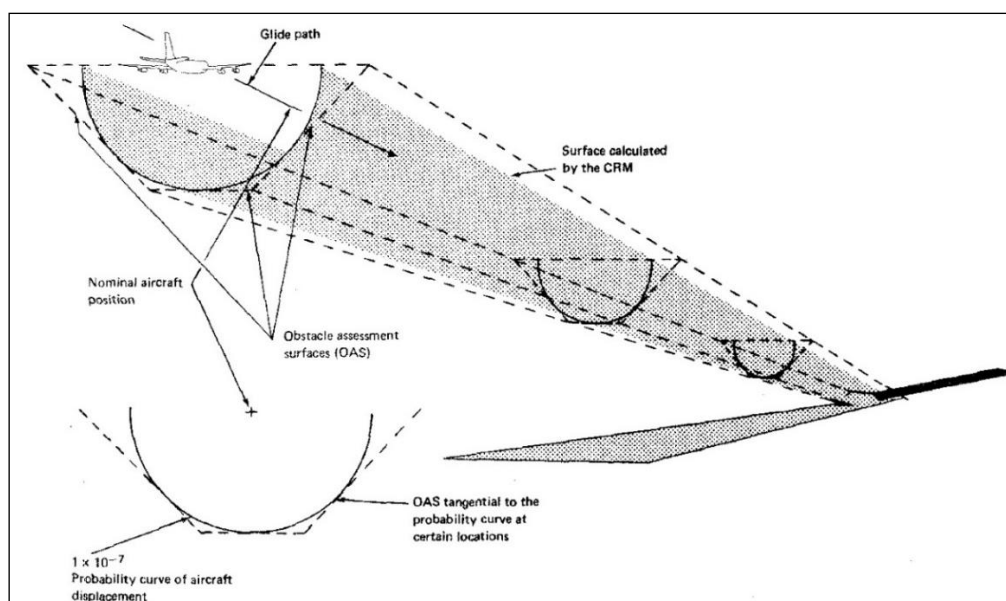
"1.4.8.4.1 The OAS consist of six sloping plane surfaces (denoted by letters W, X, Y, and Z) arranged symmetrically about the precision segment track, together with the horizontal plane which contains the threshold..."

"1.4.8.4.2 For each surface a set of constants (A, B and C) are obtained from the PANS-OPS OAS software for the operational range of localizer threshold distances and glide path angles. Separate sets of constants are specified for Category I and II."

5.6.3 Collision Risk Model (CRM)

PANS-OPS (Document 8168), Volume 2, Part II - Section 1, Chapter 1, paragraph 1.1.5.4 "Third method" states:

"The third method, using a collision risk model (CRM), is employed either as an alternative to the use of the OAS criteria (second method) or when the obstacle density below the OAS is considered to be excessive. The CRM accepts all objects as an input and assesses, for any specific OCA/H value, both the risk due to individual obstacles and the accumulated risk due to all the obstacles. It is intended to assist operational judgement in the choice of an OCA/H value."



The Approach Funnel (CRM)

The Airport Services Manual (Document 9137), Part 6 - Control of Obstacles, Chapter 1 - Surfaces, paragraph 1.3.4 ILS Collision Risk Model (CRM) states:

"The approach funnel of the OAS was designed against an over-all risk budget of one accident in 10 million approaches (i.e., a target level of safety of 1×10^{-7} per approach). One consequence was that an operational judgement was required to assess the acceptable density of obstacles in the vicinity of the OAS, although they might be below the surface itself. In addition, the OAS were overprotective in certain areas, because they were relatively simple plane surfaces designed to enclose a complex shape and to allow easy manual application. As a consequence of these factors, a more sophisticated method of relating obstacle heights and locations to total risk and OCA/H was developed. This method was embodied in a computer programme called the Collision Risk Model (CRM). It enables a far more realistic assessment of the effects of obstacles, both individually and collectively."

The Airport Services Manual (Document 9137), Part 6 - Control of Obstacles, Chapter 1 - Surfaces, paragraph 1.5 Background of the Collision Risk Model states:

"1.5.1 The Collision Risk Model (CRM) is a computer programme that calculates the probability of collision with obstacles by an aeroplane on an ILS approach and subsequent missed approach."

1.5.3 Although the OAS criteria are designed to achieve a specified target level of safety, they may result in a greater level of safety being imposed and consequently unnecessarily prevent operations to low minima or, alternatively, they may result in the safety of operations being degraded below the required standards."

The CRM has been developed in response to these problems. It will:

- a) provide risk computations (separately for all obstacles and for individual obstacles) to a specific set of conditions and runway environment; and*
- b) provide minimum acceptable OCA/H values for a specific set of conditions and runway environment."*

1.5.4 The CRM may also be used to assist:

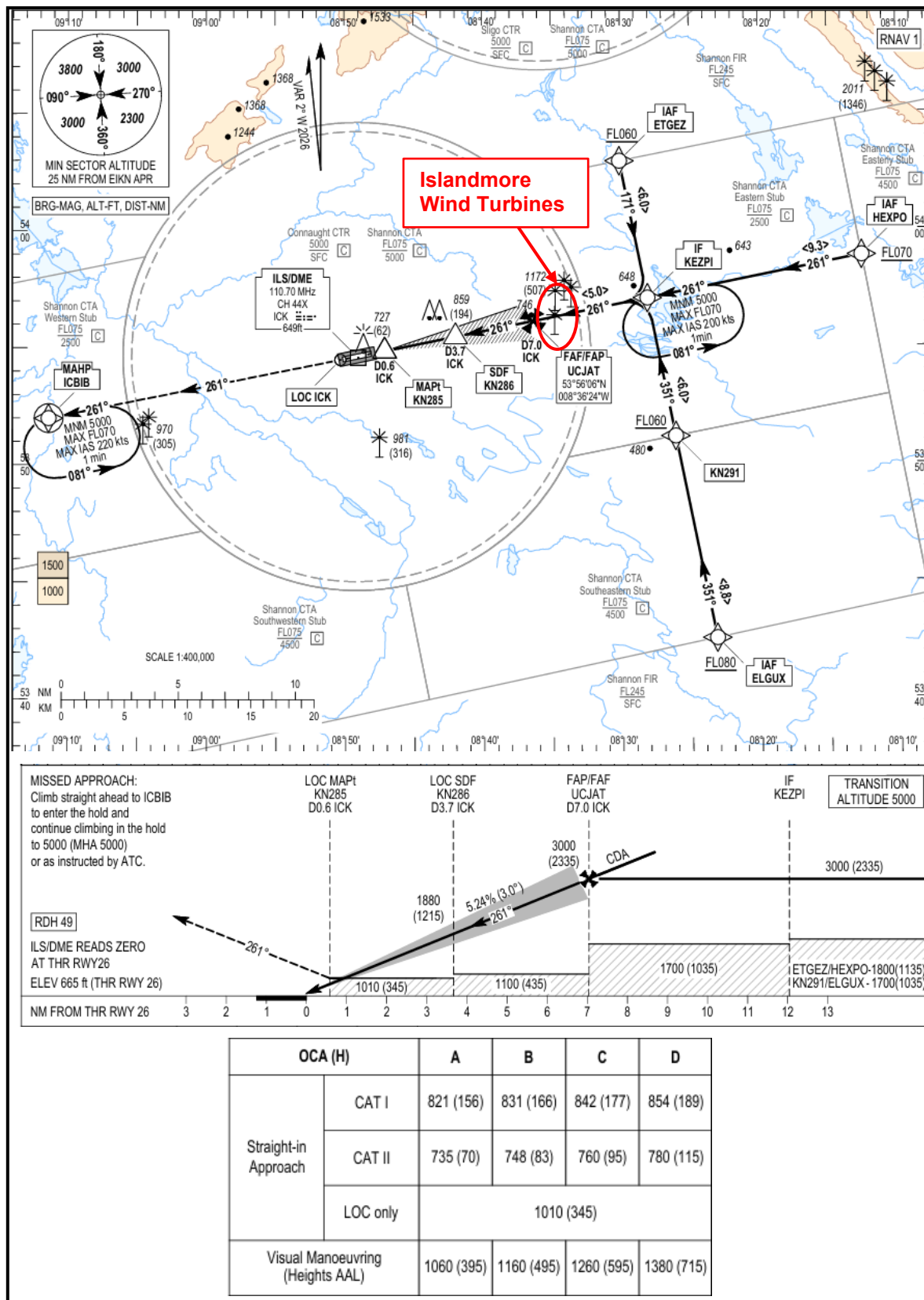
- a) in aerodrome planning (in evaluating possible locations for new runways in a given geographical and obstacle environment),*
- b) in deciding whether or not an existing object should be removed; and*
- c) in deciding whether or not a particular new construction would result in an operational penalty (i.e., in an increase in OCA/H).***

Any obstacle with a risk value greater than $1.0E-07$ will affect the minimums for the approach. (See PANS-OPS, Volume II, Paragraph 2.1.4.7.3).

The assessment of the impact of the proposed Islandmore Wind Turbines on all ILS approaches at Ireland West / Knock Airport was done using the two comprehensive methods:

- 1. Obstacle Assessment Surfaces (OAS)**
- 2. Collision Risk Model (CRM)**

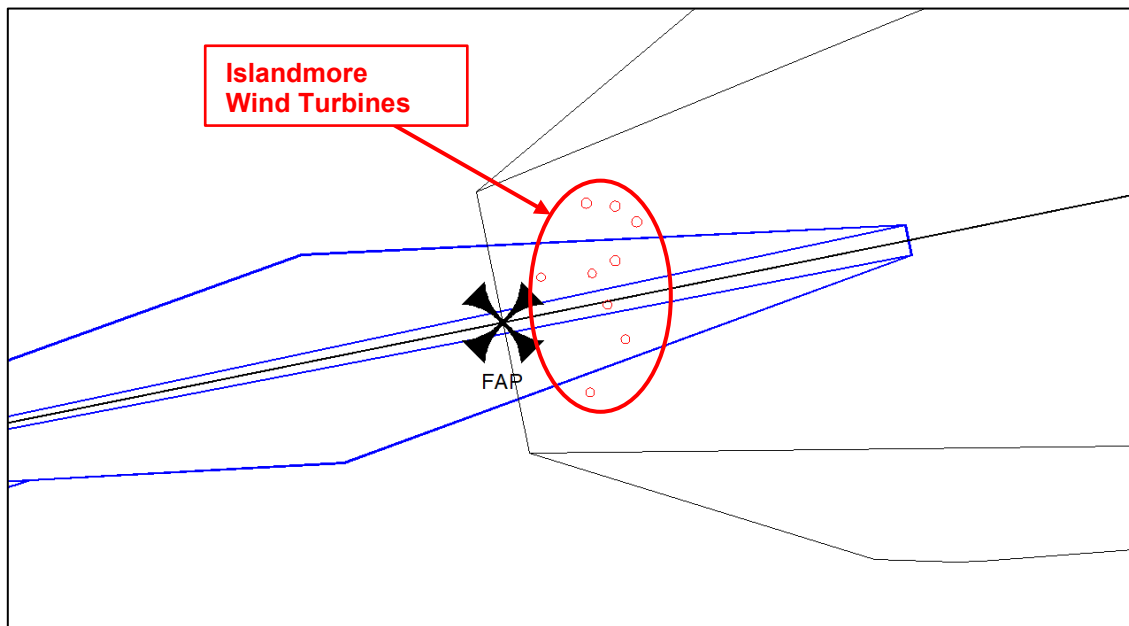
5.7 ILS Z Runway 26



5.7.1 Intermediate segment

The Intermediate segment was constructed with a following parameters:

Tolerances - KEZPI	
ATT	0.8 nm
XTT	1 nm
Area Semi Width	2.5 nm
Tolerances - UCJAT	
ATT	0.24 nm
XTT	0.3 nm
Area Semi Width	1.45 nm



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located in the primary area of the intermediate segment protection areas.

Intermediate segment assessment

ID	Alt.	Area	MOC	MOCA required (ft)	MOCA Published (ft)
Position T3	357.0	P	150	1663.4	1700

As can be seen in the previous table the proposed Islandmore Wind Turbines do not affect the intermediate approach segment of the ILS Z approach to runway 26.

5.7.2 ILS CAT I

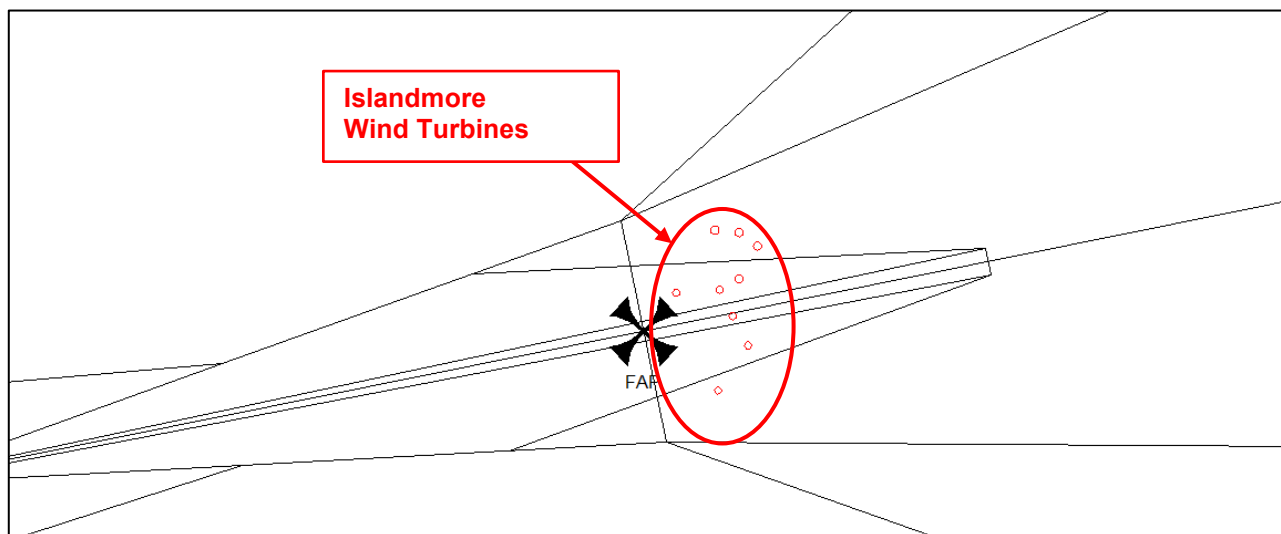
The ILS CAT I Obstacle Assessment Surfaces were calculated and constructed using the following parameters:

Obstacle Protection Areas

The obstacle protection areas were constructed using the following parameters:

Threshold Position	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.75 m (665.18 ft)
Input Parameters	
In-bound Track	258.90 °
Preceding Segment Altitude	3000 ft
Preceding Segment MOC	150 m
Category	ILS CAT I
Glide Path Angle	3 °
MA Climb Gradient	2.5 %
RDH at THR	49 ft
Course Width at LTP/FTP	210 m
GARP/LOC to THR Distance	2497.89 m
Aircraft Category	D
Height Loss	49 m (160.76 ft)
Height Loss Correction	0 m (0 ft)
Wing Semi Span	32.5 m
Wheel Height	7 m
Missed Approach Evaluation Method	XE datum (std.)
Earth Radius	6367444.66 m
Calculated Parameters	
Xe	900 m
FAP Distance	7.04 nm
SOC Distance	736.8 m past the threshold

	A	B	C
W	0.028500		-9.07
X	0.026743	0.176317	-17.66
Y	0.023018	0.201904	-22.39
Z	-0.025000		-22.50



As can be seen in the previous diagram, the proposed Islandmore Wind Turbines are situated within the intermediate OAS W, X1, and X2 surfaces.

OAS assessment category A&B

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T10	300.0	X1	655.4	-355.4	No
Position T8	292.0		693.5	-401.5	No
Position T7	311.0	W	622.9	-311.9	No
Position T5	317.0	X2	658.4	-341.4	No
Position T6	304.0		658.1	-354.1	No
Position T4	306.0		682.8	-376.8	No

OAS assessment category C&D

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T10	300.0	X1	653.9	-353.9	No
Position T8	292.0		692.1	-400.1	No
Position T7	311.0	W	621.9	-310.9	No
Position T5	317.0	X2	657.0	-340.0	No
Position T6	304.0		656.7	-352.7	No
Position T4	306.0		681.4	-375.4	No

As can be seen in the previous tables, the ILS OAS CAT I is not affected by the proposed **Islandmore Wind Turbines**.

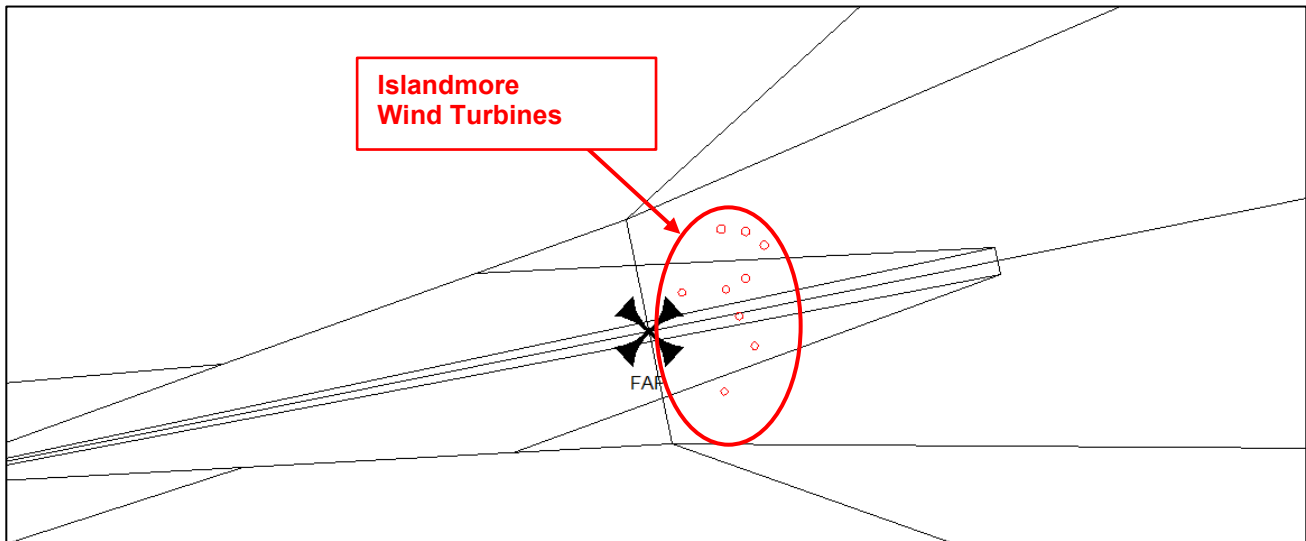
5.7.1 ILS CAT II

The ILS CAT II Obstacle Assessment Surfaces were calculated and constructed using the following parameters:

Threshold Position	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.75 m (665.18 ft)
Input Parameters	
In-bound Track	258.90 °
Preceding Segment Altitude	3000 ft
Preceding Segment MOC	150 m
Category	ILS CAT II
Glide Path Angle	3 °
MA Climb Gradient	2.5 %
RDH at THR	49 ft
Course Width at LTP/FTP	210 m
GARP/LOC to THR Distance	2497.89 m
Aircraft Category	D
Height Loss	26 m (85.3 ft)
Height Loss Correction	0 m (0 ft)
Wing Semi Span	32.5 m
Wheel Height	7 m
Missed Approach Evaluation Method	XE datum (std.)
Earth Radius	6367444.66 m
Calculated Parameters	
Xe	900 m
FAP Distance	7.04 nm
SOC Distance	728.3 m past the threshold

	A	B	C
W	0.028500		-9.07
X	0.026743	0.176317	-17.66
Y	0.023018	0.201904	-22.39
Z	-0.025000		-22.50

	A	B	C
W	0.035800		-7.26
X	0.034377	0.228683	-22.68
Y	0.030981	0.271751	-29.76
Z	-0.025000		-22.50



As can be seen in the previous diagram, the proposed Islandmore Wind Turbines are situated within the intermediate OAS W, X1, and X2 surfaces.

OAS assessment category A&B

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T10	300.0	X1	655.4	-355.4	No
Position T8	292.0		693.5	-401.5	No
Position T7	311.0	W	622.9	-311.9	No
Position T5	317.0	X2	658.4	-341.4	No
Position T6	304.0		658.1	-354.1	No
Position T4	306.0		682.8	-376.8	No

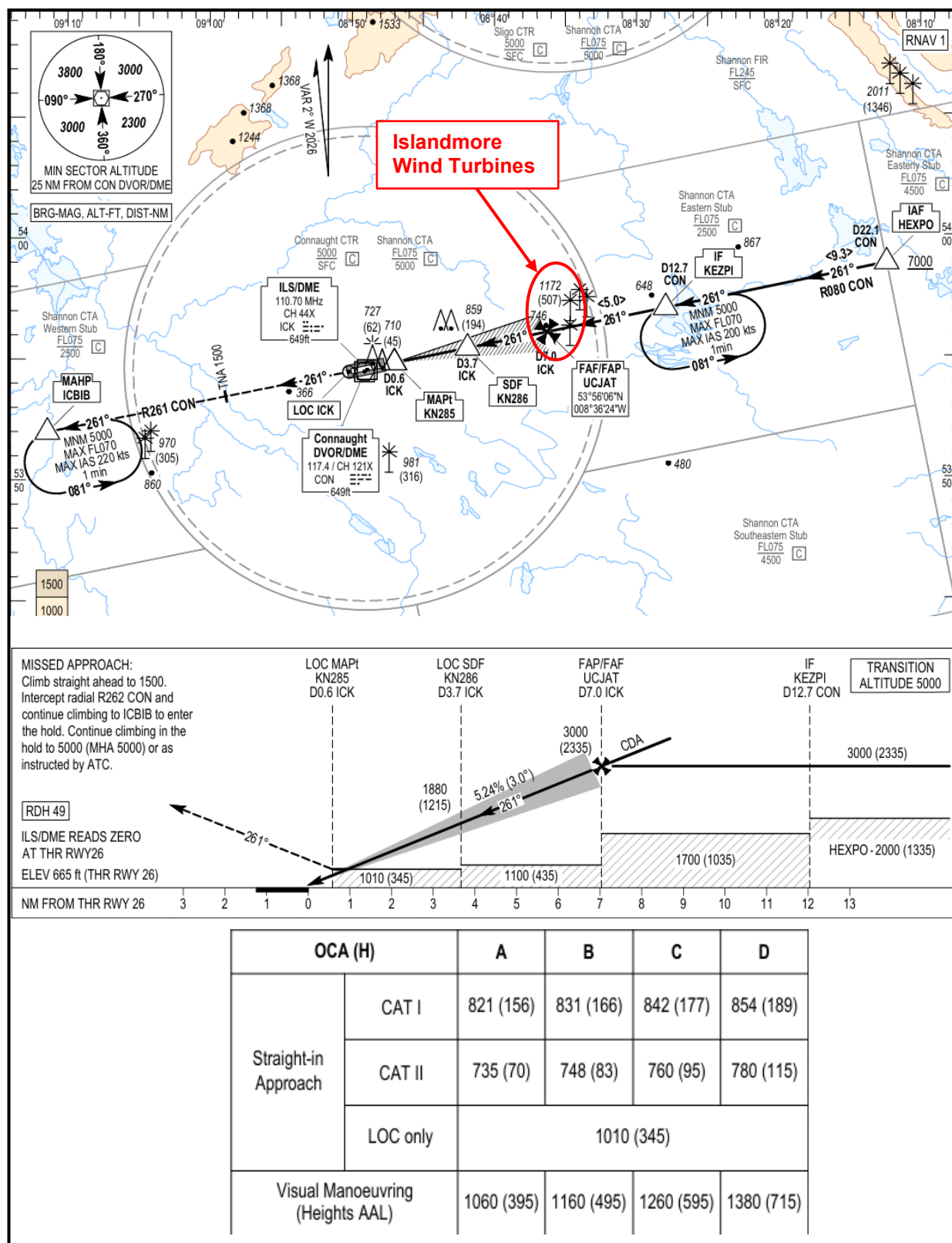
OAS assessment category C&D

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T10	300.0	X1	653.9	-353.9	No
Position T8	292.0		692.1	-400.1	No
Position T7	311.0	W	621.9	-310.9	No
Position T5	317.0	X2	657.0	-340.0	No
Position T6	304.0		656.7	-352.7	No
Position T4	306.0		681.4	-375.4	No

As can be seen in the previous tables, the ILS OAS CAT II is not affected by the proposed **Islandmore Wind Turbines**.

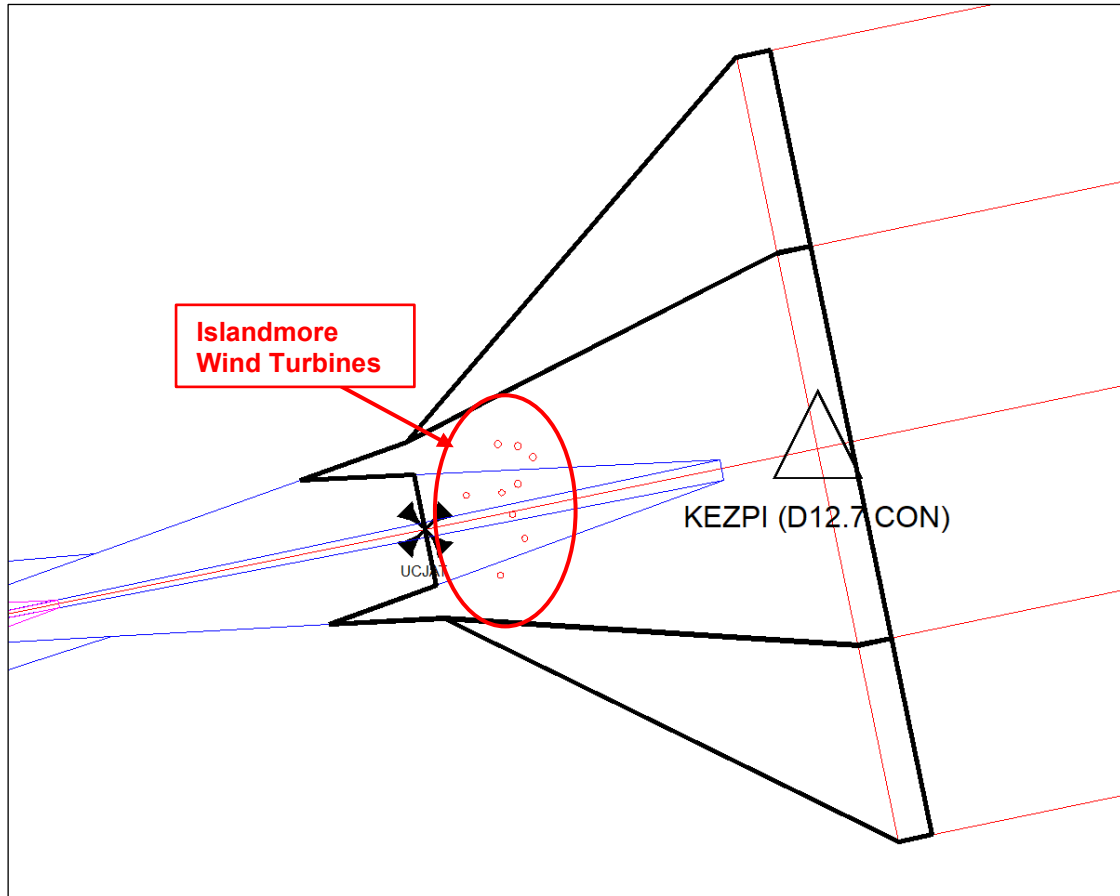
The ILS Z approach for runway 26 is not affected by the proposed **Islandmore Wind Turbines**.

5.8 ILS Y Runway 26



5.8.1 Intermediate segment

The intermediate approach segment width expands uniformly from the width of the final approach segment to 5.0 NM on each side of the track



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located in the primary area of the intermediate segment protection areas.

Intermediate segment assessment

ID	Alt.	Area	MOC	MOCA required (ft)	MOCA Published (ft)
Position T3	357.0	P	150	1663.4	1700

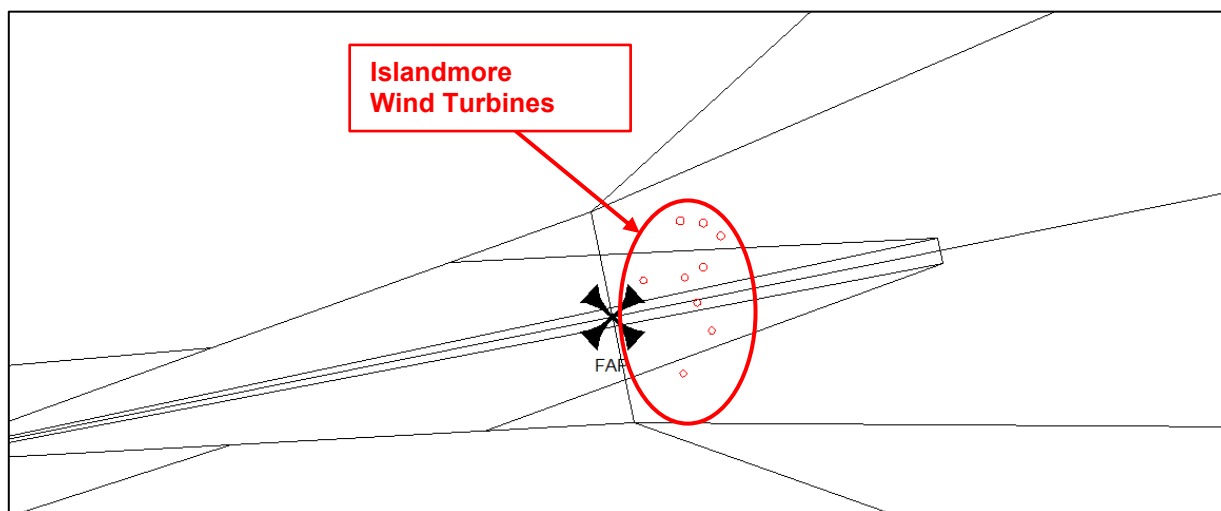
As can be seen in the previous table the proposed Islandmore Wind Turbines do not affect the intermediate approach segment of the ILS Y approach to runway 26.

5.8.2 ILS CAT I

The ILS CAT I Obstacle Assessment Surfaces were calculated and constructed using the following parameters:

Threshold Position	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.75 m (665.18 ft)
In-bound Track	258.90 °
Preceding Segment Altitude	3000 ft
Intermediate MOC	150 m
Category	ILS CAT I
Glide Path Angle	3 °
MACG	2.5 %
RDH at THR	49 ft
Course Width	210 m
GARP/LOC - THR	2497.89 m
M/A Eval.	Standard
Earth Radius	6367444.66 m
Xe	900 m
FAP Dist.	7.04 nm
SOC Dist.	736.8 m +Thr

	A	B	C
W	0.028500		-9.07
X	0.026743	0.176317	-17.66
Y	0.023018	0.201904	-22.39
Z	-0.025000		-22.50



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As can be seen in the previous diagram, the proposed Islandmore Wind Turbines are situated inside the and intermediate OAS W, X1 and X2 surfaces.

OAS assessment category A&B

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T10	300.0	X1	655.3	-355.3	No
Position T8	292.0		693.5	-401.5	No
Position T7	311.0	W	622.9	-311.9	No
Position T5	317.0	X2	658.5	-341.5	No
Position T6	304.0		658.2	-354.2	No
Position T4	306.0		682.9	-376.9	No

OAS assessment category C&D

Name	Alt.	Surf.	Surf. Alt.	Diff.	Cont.
Position T10	300.0	X1	653.8	353.8	No
Position T8	292.0		692.0	-400.0	No
Position T7	311.0	W	621.9	-310.9	No
Position T5	317.0	X2	657.0	-340.0	No
Position T6	304.0		656.8	-352.8	No
Position T4	306.0		681.5	-375.5	No

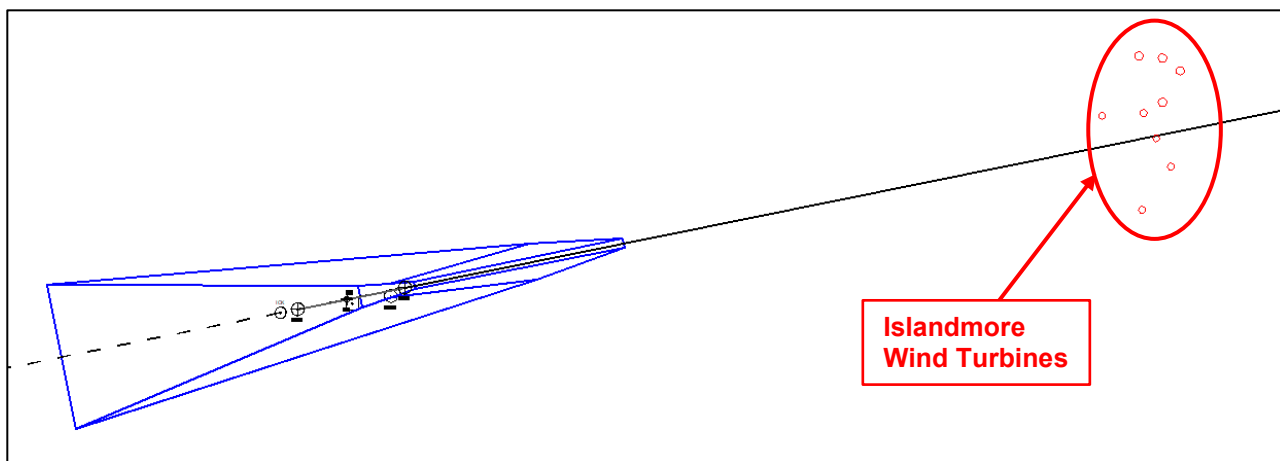
As can be seen in the previous diagram, the proposed Islandmore Wind Turbines are situated within the intermediate OAS W, X1, and X2 surfaces.

5.8.3 ILS CAT II

The ILS CAT II Obstacle Assessment Surfaces were calculated and constructed using the following parameters:

Threshold Position	
Latitude	53°54'44.33"N
Longitude	008°48'04.78"W
Altitude	202.75 m (665.18 ft)
In-bound Track	258.90 °
Preceding Altitude	3000 ft
Intermediate MOC	150 m
Category	ILS CAT II
Glide Path Angle	3 °
MACG	2.5 %
RDH at THR	49 ft
Course Width	210 m
GARP/LOC - THR	2497.89 m
HL Correction	0 m (0 ft)
M/A Eval.	Standard
Earth Radius	6367444.66 m
Xe	900 m
FAP Dist.	7.04 nm
SOC Dist.	728.3 m +Thr

	A	B	C
W	0.035800		-7.26
X	0.034377	0.228683	-22.68
Y	0.030981	0.271751	-29.76
Z	-0.025000		-22.50



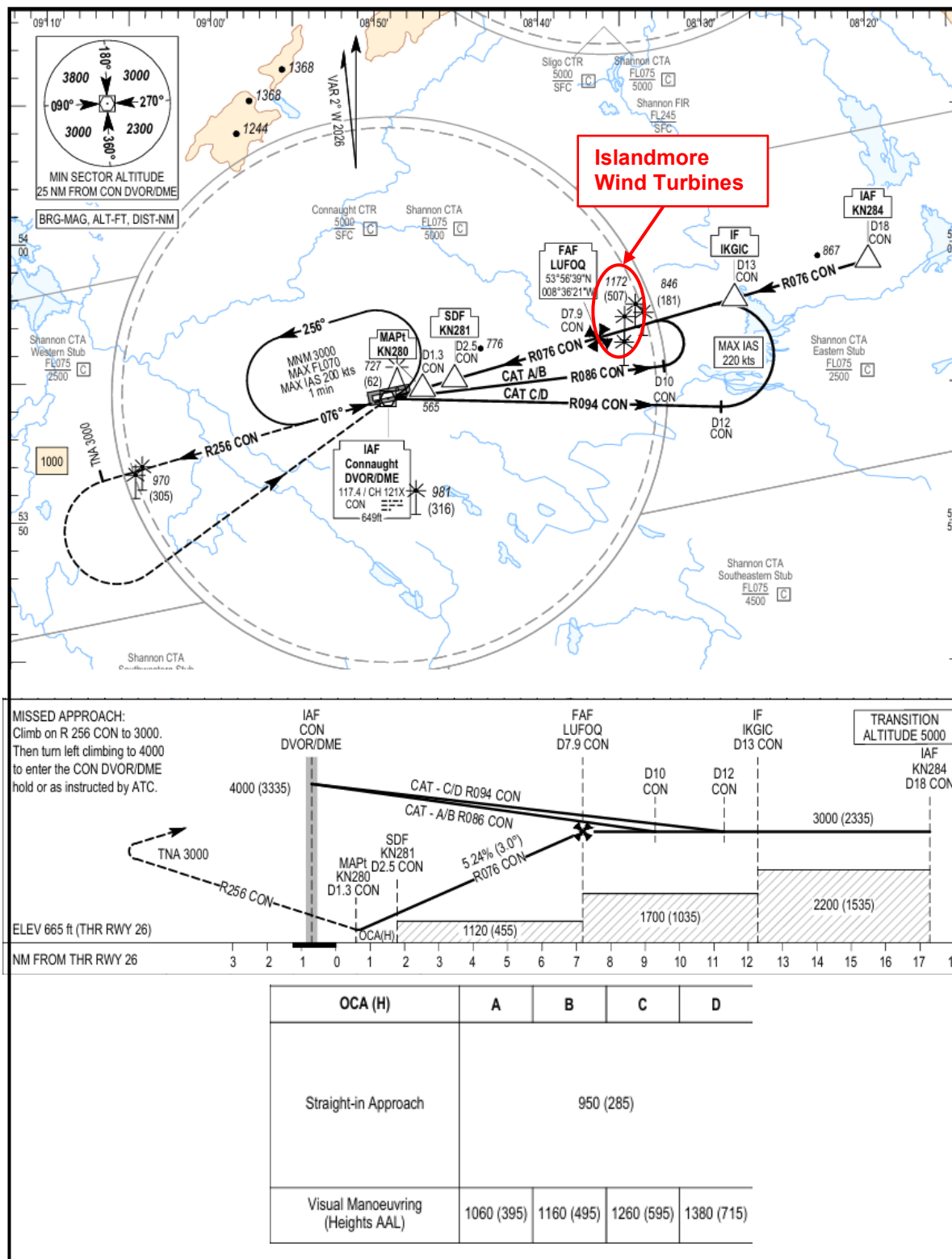
As can be seen in the previous diagram, the proposed **Islandmore Wind Turbines** are situated outside the CAT II OAS surfaces.

The ILS Y approach for runway 26 is not affected by the proposed Islandmore Wind Turbines.

Islandmore Wind Turbines Ireland West / Knock Airport Special Aeronautical Study

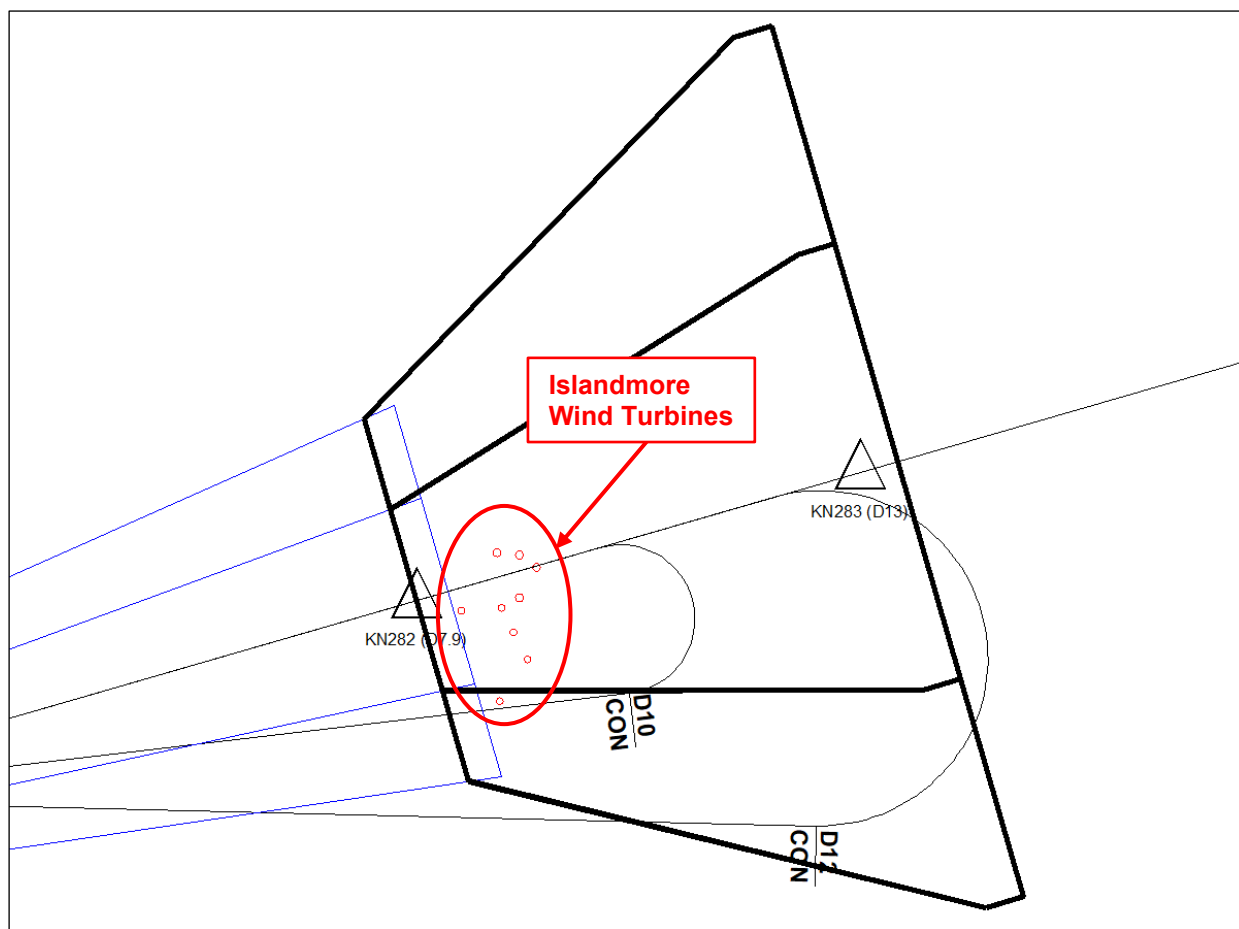


5.9 VOR runway 26



The VOR radial tolerance was constructed using the following parameters:

Navigational Aid		
Type	VOR	VOR
ID	CON	CON
Latitude	53°54'28.90"N	53°54'28.90"N
Longitude	008°49'12.40"W	008°49'12.40"W
Parameters		
Out-bound Track	R 086	R 266
Distance to Start	0 nm	0 nm
Distance to Finish	7.8 nm	11.8 nm
Tolerance Type	Area Splay	Area Splay

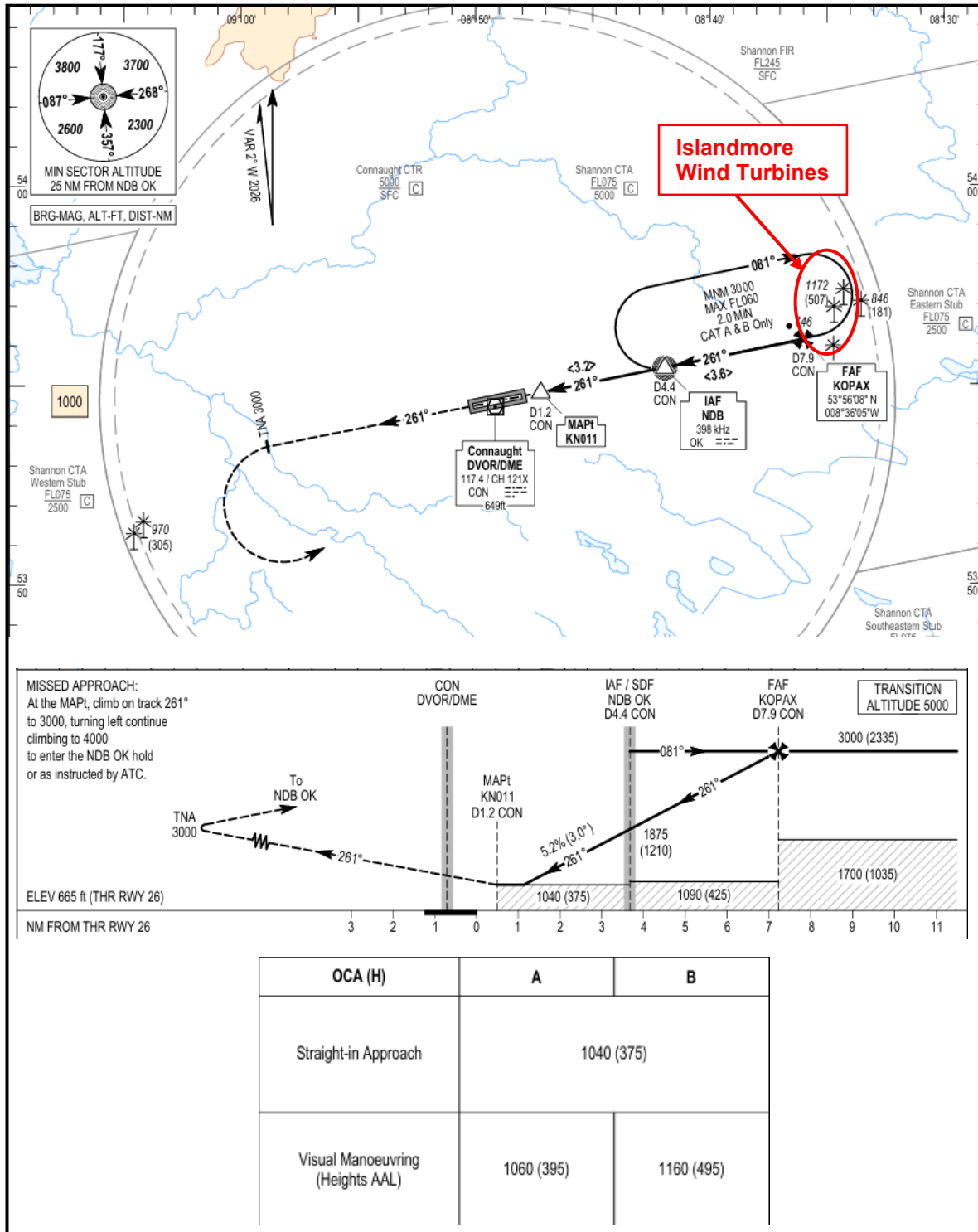


As can be seen in the previous picture, the proposed Islandmore Wind Turbines are situated within the intermediate segment of the VOR approach for runway 26.

Intermediate segment assessment

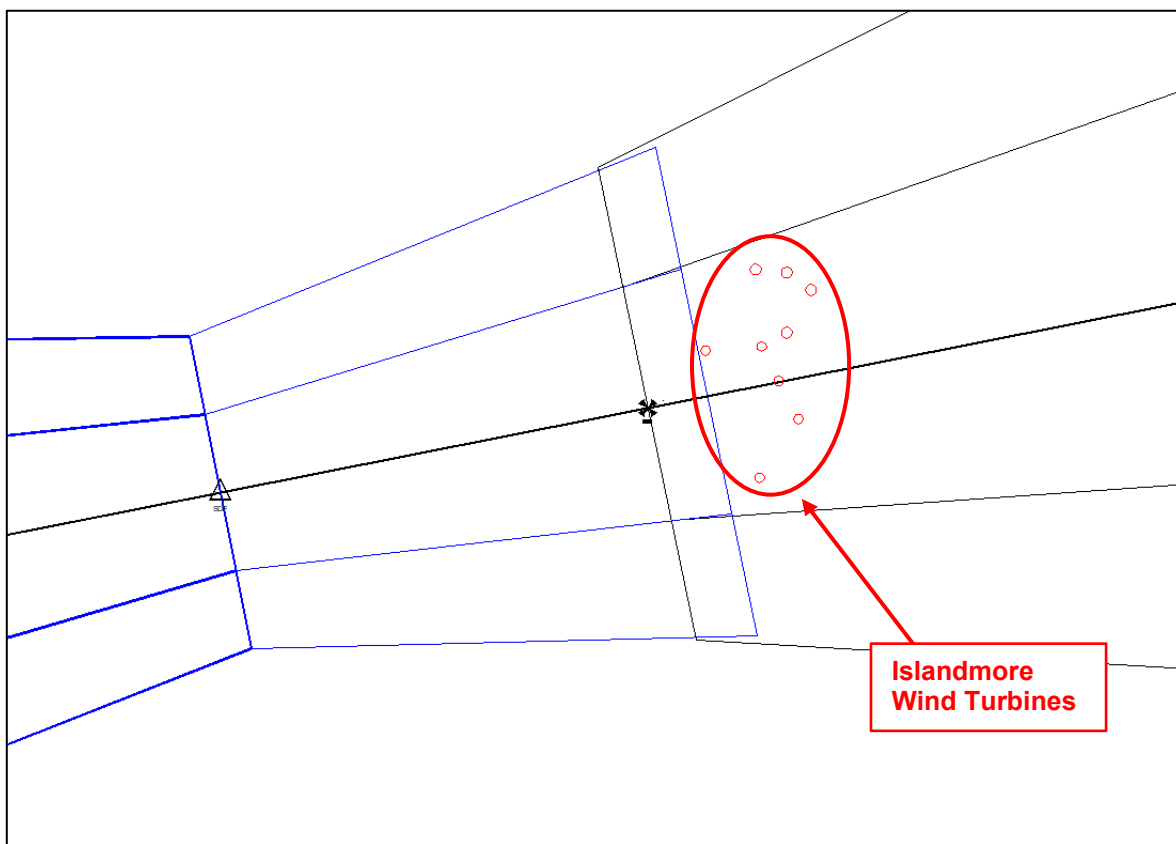
ID	Alt.	Area	MOC	MOCA required (ft)	MOCA Published (ft)
Position T3	357.0	P	150	1663.4	1700

The VOR approach procedure for runway 26 is not affected by the proposed Islandmore Wind Turbines.



The NDB radial tolerance was constructed using the following parameters:

Navigational Aid	
Type	NDB
ID	OK
Latitude	53°55'26.20"N
Longitude	008°41'59.30"W
Parameters	
Out-bound Track	079.05 °
Distance to Start	0 nm
Distance to Finish	3.5 nm
Tolerance Type	Area Splay



As can be seen in the previous picture, the proposed Islandmore Wind Turbines are located within the intermediate approach segment.

Intermediate segment assessment

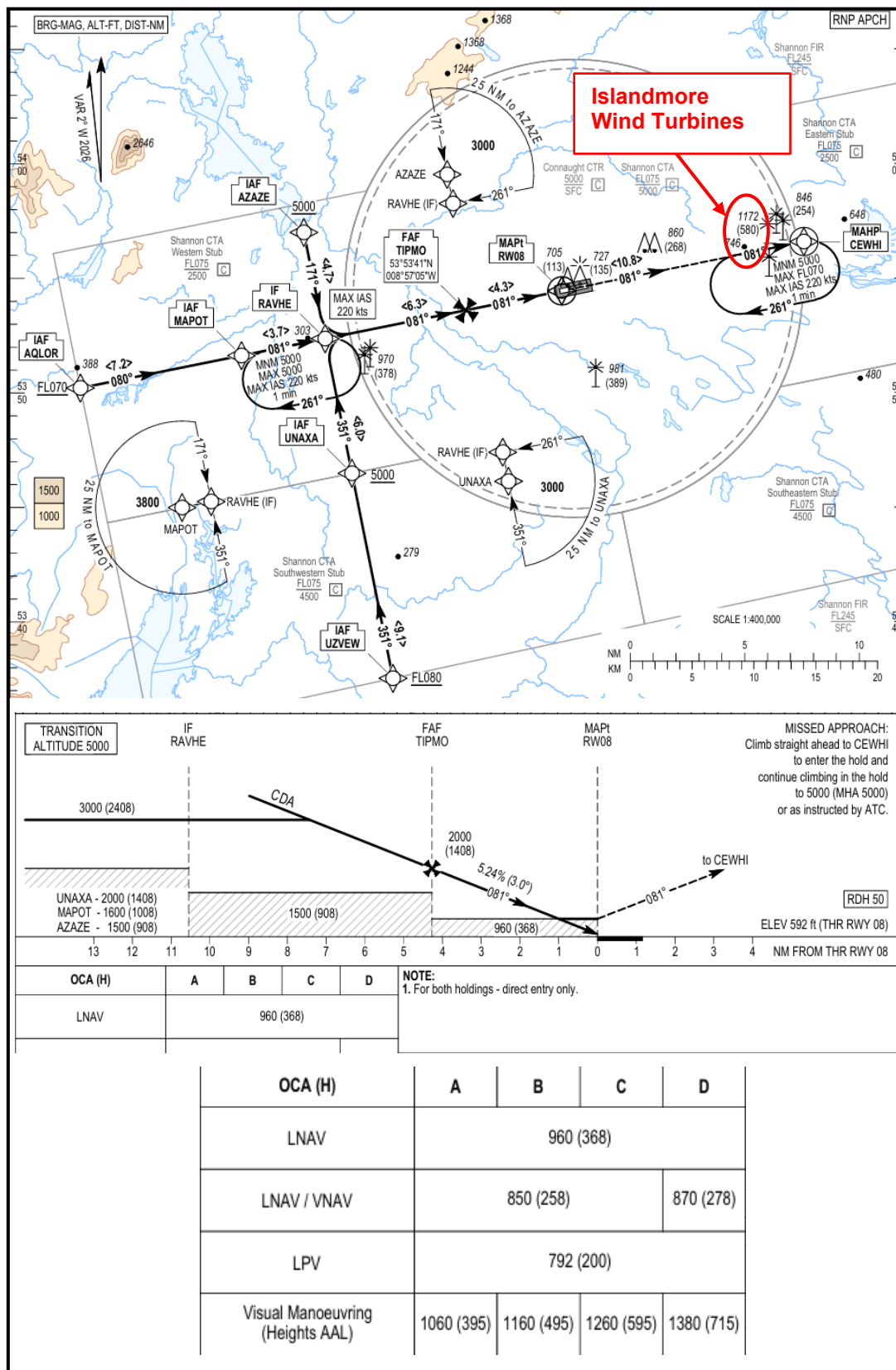
ID	Alt.	Area	MOC	MOCA required (ft)	MOCA Published (ft)
Position T3	357.0	P	150	1663.4	1700

The NDB approach procedure for runway 26 is not affected by the proposed Islandmore Wind Turbines.

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5.11 RNP Runway 08



5.11.1 LNAV Approach

Missed approach segments were constructed with the following parameters:

Missed Approach (Initial Phase)

Starting Position	
ID	RW08
Latitude	53°54'30.72"N
Longitude	008°50'00.46"W
Finishing Position	
ID	SOC
Latitude	53°54'45.50"N
Longitude	008°47'55.87"W
Result	
Forward True Bearing	078.62 °
Distance Between Positions	1.25 nm / 2.32 km

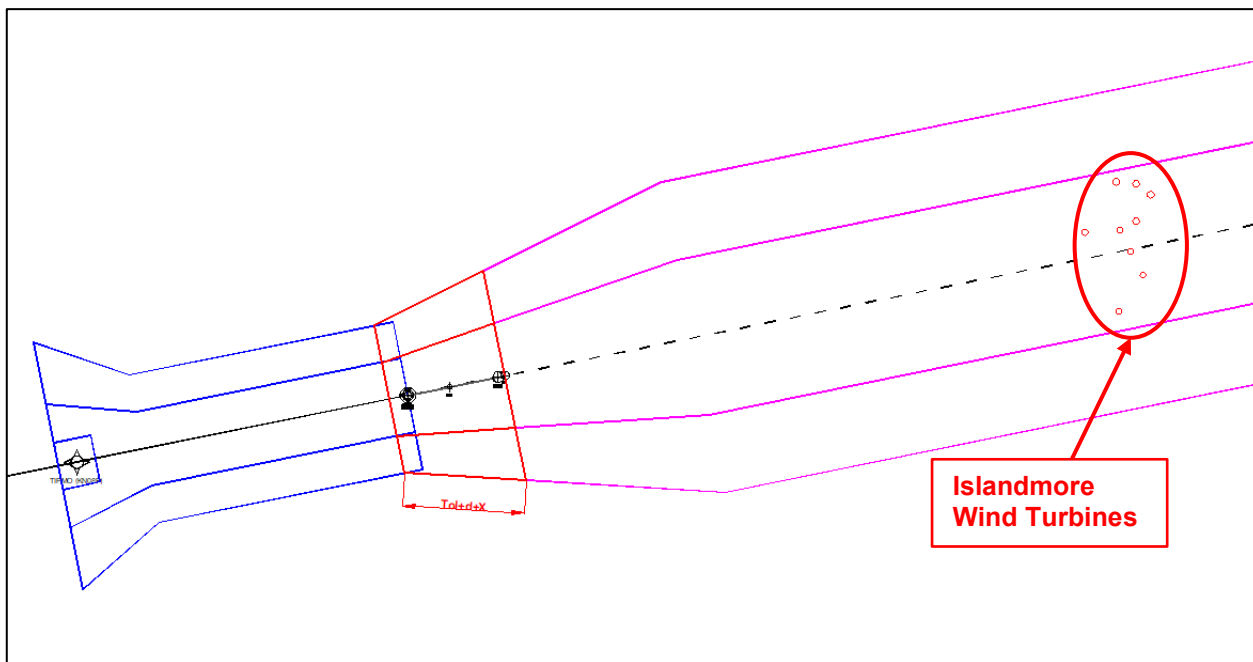
The position of the SOC was calculated using the following parameters:

Parameters	
IAS	185 kts
Altitude	940 ft
ISA	15 °C

Results	
TAS	192.4 kts
X (10 kts / 15 s)	1562.04 m
d (10 kts / 3 s)	312.41 m

Missed Approach (Intermediate Phase)

Starting Position	
ID	SOC
Latitude	53°54'45.50"N
Longitude	008°47'55.87"W
Finishing Position	
ID	LESRO
Latitude	53°59'22.68"N
Longitude	008°07'34.00"W
Result	
Forward True Bearing	078.75 °
Distance Between Positions	24.29 nm / 44.99 km



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located within the intermediate missed approach protection areas.

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Intermediate missed approach assessment

ID	Alt.	Area	Do	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	P	15478.4	30.0	2209.6	1269.7	0.7

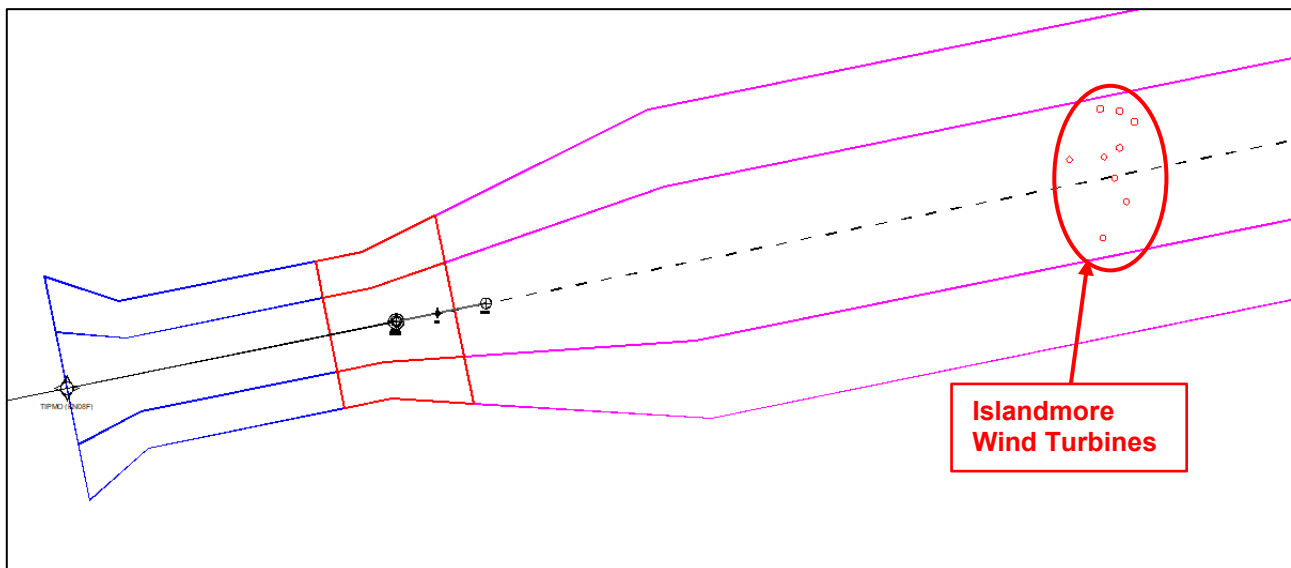
As can be seen in the previous table the Intermediate missed approach segment is not affected by the proposed Islandmore Wind Turbines.

5.11.2 LNAV/VNAV Approach

LNAV/VNAV OAS was constructed with the following parameters:

Aerodrome	
Reference Point (ARP)	
Latitude	53°54'37.00"N
Longitude	008°49'07.00"W
Altitude	202.69 m (665 ft)
Minimum Temperature	-5 °C
Runway	
Threshold Position	
ID	THR08
Latitude	53°54'30.72"N
Longitude	008°50'00.46"W
Altitude	180.44 m (592 ft)
Direction	078.72 °
Input Parameters	
Inter. Seg. Min. (OCA)	2000 ft
Intermediate Segment MO	150 m
RDH at THR	50 ft
Vertical Path Angle [VPA]	3 °
THR to FAWP Distance	4.27 nm
Aircraft Category	D

Max. IAS	185 kts
Height Loss	49 m (160.76 ft)
Height Loss Correction	0 m (160.76 ft)
APV Segment Termination	25.55 nm past the thre
Missed Approach Point	
ID	RW08
Latitude	53°54'30.72"N
Longitude	008°50'00.46"W
Missed Approach Climb G	2.5 %
Missed Approach MOC	30 m
M/A Evaluation Method	Standard
Calculated Parameters	
X FAP	7898.03 m
Temperature Correction	26.63 m
Minimum VPA	2.81 °
Temp. 3.5° VPA	62.2°C
X FAS [75 m]	1584.77 m
FAS Angle [75 m]	2.77 °
Xz	-1400 m
SOC Distance	601.8 m past the thres



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located within the Z surface of the LNAV/VNAV OAS.

OAS Z surface - category A

ID	Alt.	Area	MOC	Surf. alt.	Diff.
Position T9	294.0	P	30.0	573.3	-279.3

OAS Z surface - category B

ID	Alt.	Area	MOC	Surf. alt.	Diff.
Position T9	294.0	P	30.0	573.3	-279.3

OAS Z surface - category C

ID	Alt.	Area	MOC	Surf. alt.	Diff.
Position T9	294.0	P	30.0	568.3	-274.3

OAS Z surface - category D

ID	Alt.	Area	MOC	Surf. alt.	Diff.
Position T9	294.0	P	30.0	560.8	-266.8

As can be seen in the previous tables the proposed Islandmore Wind Turbines do not affect the LNAV/VNAV approach procedure for runway 08.

5.11.3 LPV Approach

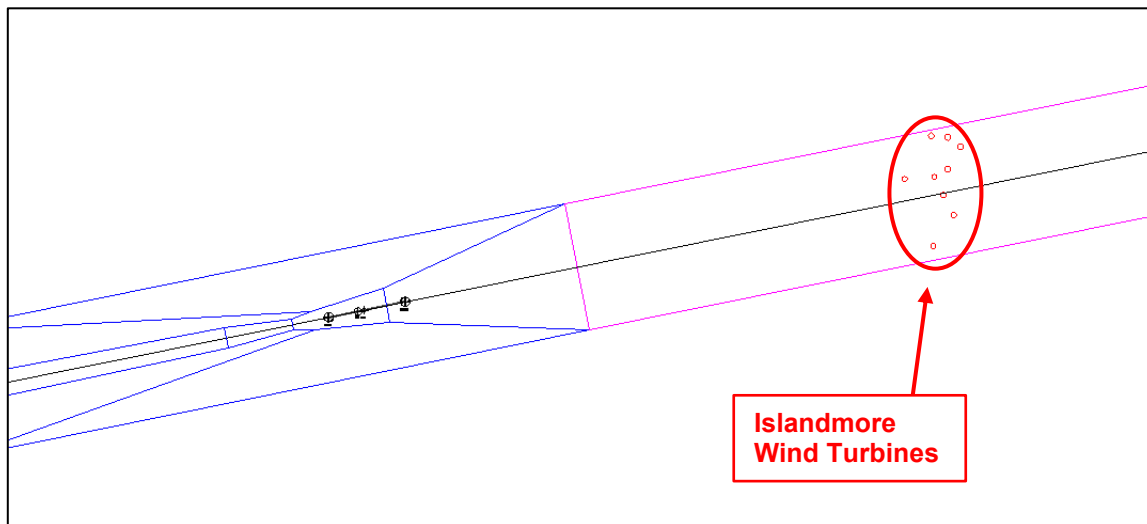
LPV missed approach segment was constructed with the following parameters:

Intermediate missed approach

Starting Position	
ID	End of OAS Z Surfac
Latitude	53°55'14.74"N
Longitude	008°43'45.27"W
Finishing Position	
ID	LESRO
Latitude	53°59'22.7"N
Longitude	008°07'34.0"W
Parameters	
Calculation Type	Ellipsoid
Result	
Forward True Bearing	078.80 °
Distance Between Position	22.5 nm / 41.67 km

SOC calculation (category D)

SOC	
Latitude	53°54'35.95"N
Longitude	008°49'16.01"W
Altitude	222.27 m (729.24 ft)
Parameters	
Track	078.58 °
MACG	2.5 %



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located inside the protection areas associated with the Intermediate missed approach segment of the LPV approach procedure to the runway 08.

Intermediate missed approach - category A

ID	Alt.	Area	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	P	2164.6	1171.3	0.8

Intermediate missed approach - category B

ID	Alt.	Area	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	P	2150.1	1171.3	0.8

Intermediate missed approach - category C

ID	Alt.	Area	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	P	2135.5	1171.3	0.8

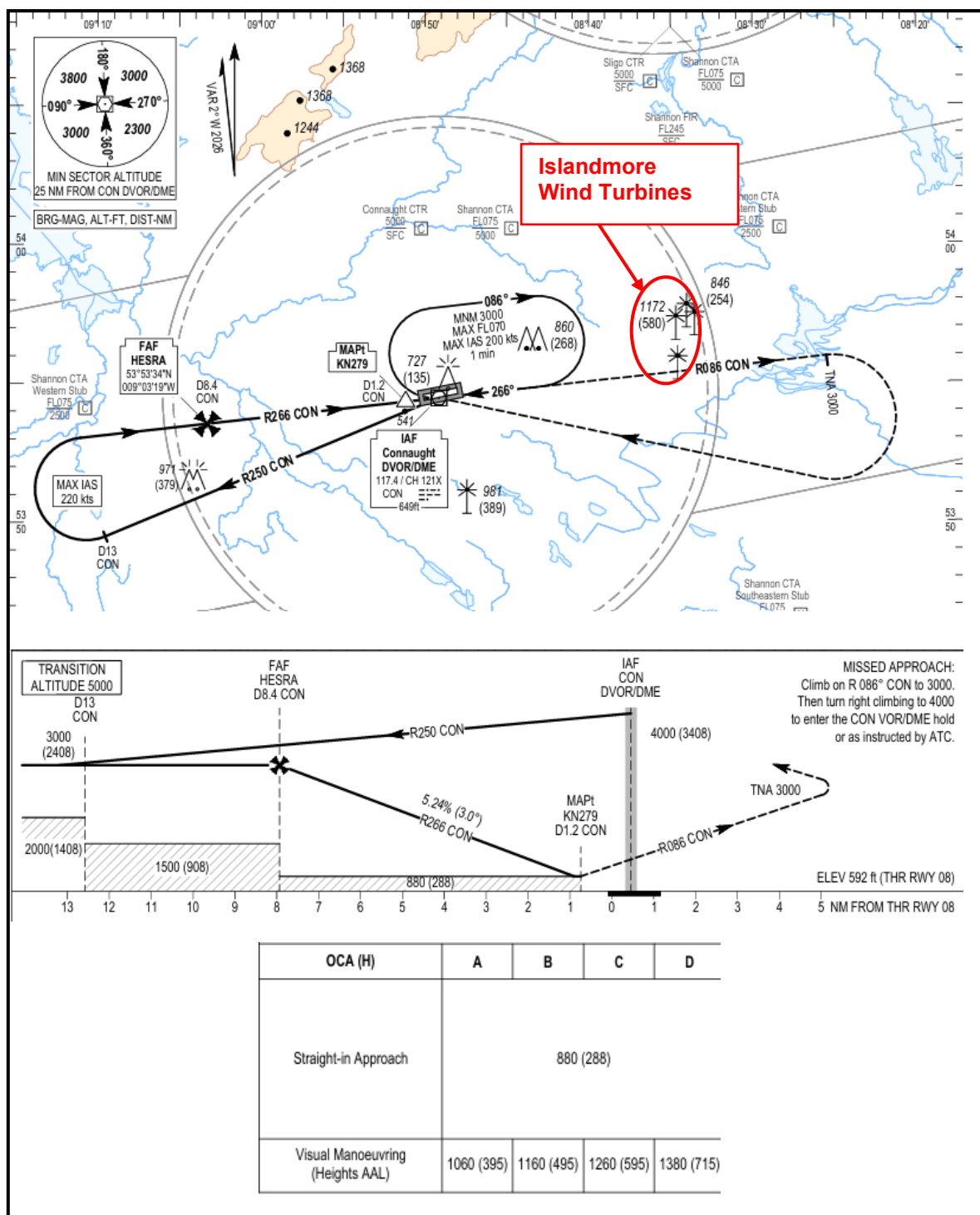
Intermediate missed approach - category D

ID	Alt.	Area	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	P	2121.0	1171.3	0.8

As can be seen in the previous tables the proposed Islandmore Wind Turbines do not affect the Intermediate missed approach segment of the LPV approach to runway 08.

The RNP procedures are not affected by the proposed Islandmore Wind Turbines.

5.12 VOR Runway 08



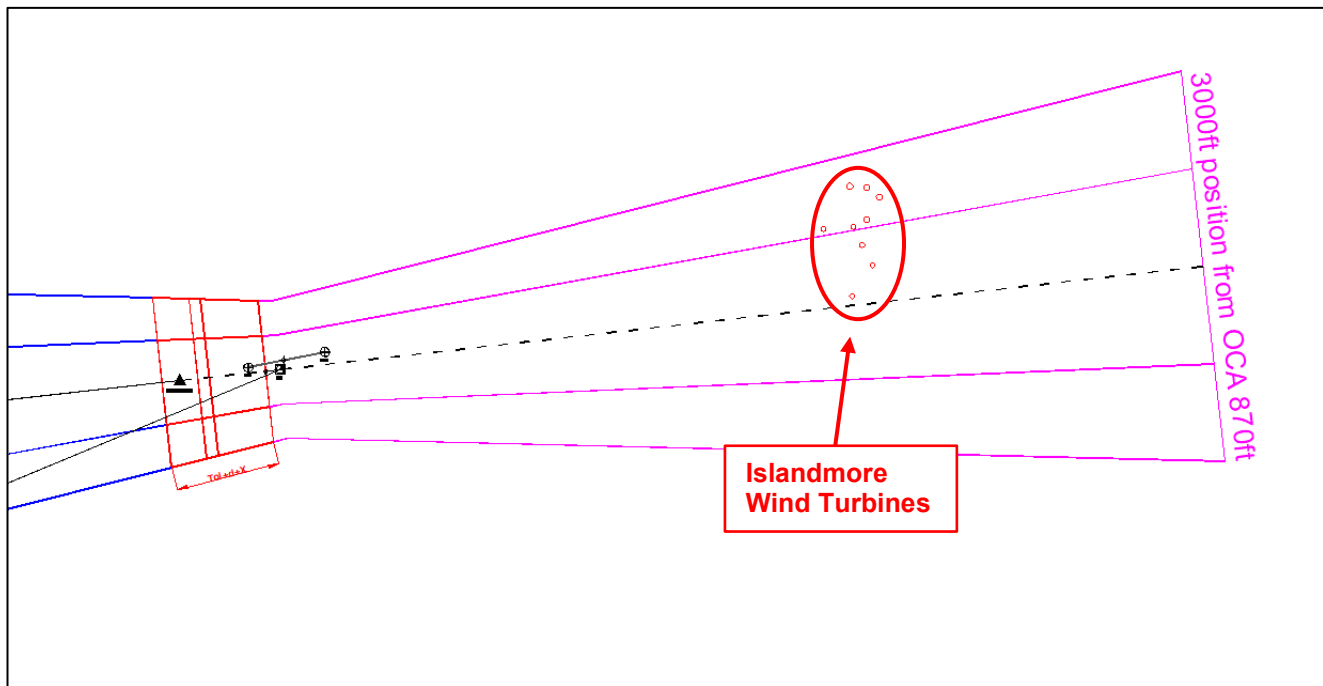
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The VOR radial tolerance was constructed using the following parameters:

Navigational Aid		
Type	VOR	VOR
ID	CON	CON
Latitude	53°54'28.90"N	53°54'28.90"N
Longitude	008°49'12.40"W	008°49'12.40"W
Parameters		
Out-bound Track	R 268	R 088
Distance to Start	0 nm	0 nm
Distance to Finish	8.39 nm	13.8 nm
Tolerance Type	Area Splay	Area Splay

Parameters	
IAS	250 kts
TAS	272.3 kts
Altitude	4000 ft
ISA	15 °C
Bank Angle	15 °
Wind	30 kts (Custom)
r	7468.23 m
E	1292.47 m
$\sqrt{r^2 + E^2}$	7579.25 m
r + E	8760.7 m
r + 2E	10053.16 m
Orientation	
Track / Radial	R 088 °
Turn Direction	Right



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located in the intermediate missed approach segment protection areas.

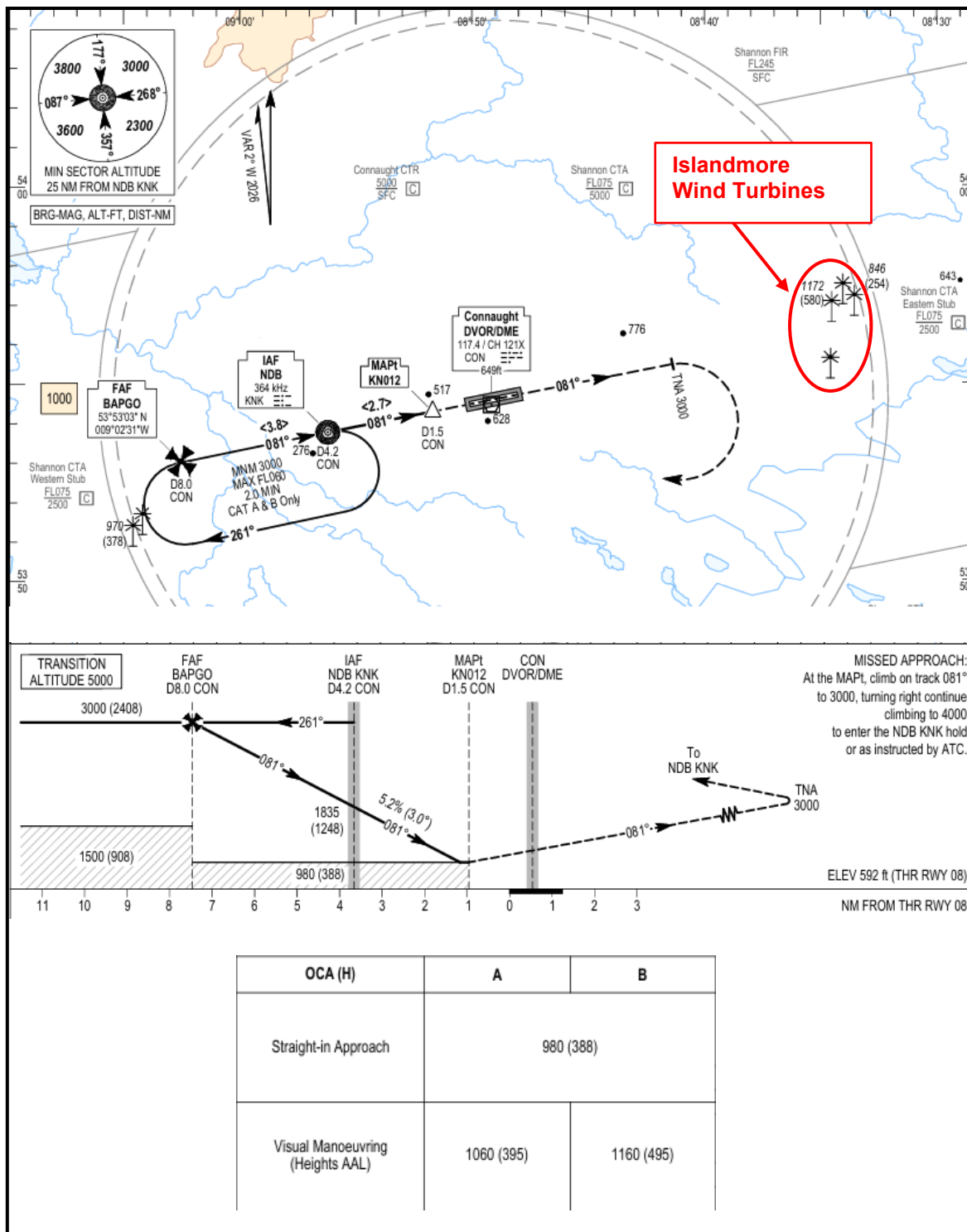
Intermediate missed approach

ID	Alt.	Area	Dist. in	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	S	612.5	21.2	2277.4	1240.9	0.7

As can be seen in the previous table the proposed Islandmore Wind Turbines do not affect the intermediate missed approach segment of the VOR approach to runway 08.

The VOR approach to runway 08 is not affected by the proposed Islandmore Wind Turbines.

5.13 NDB Runway 08



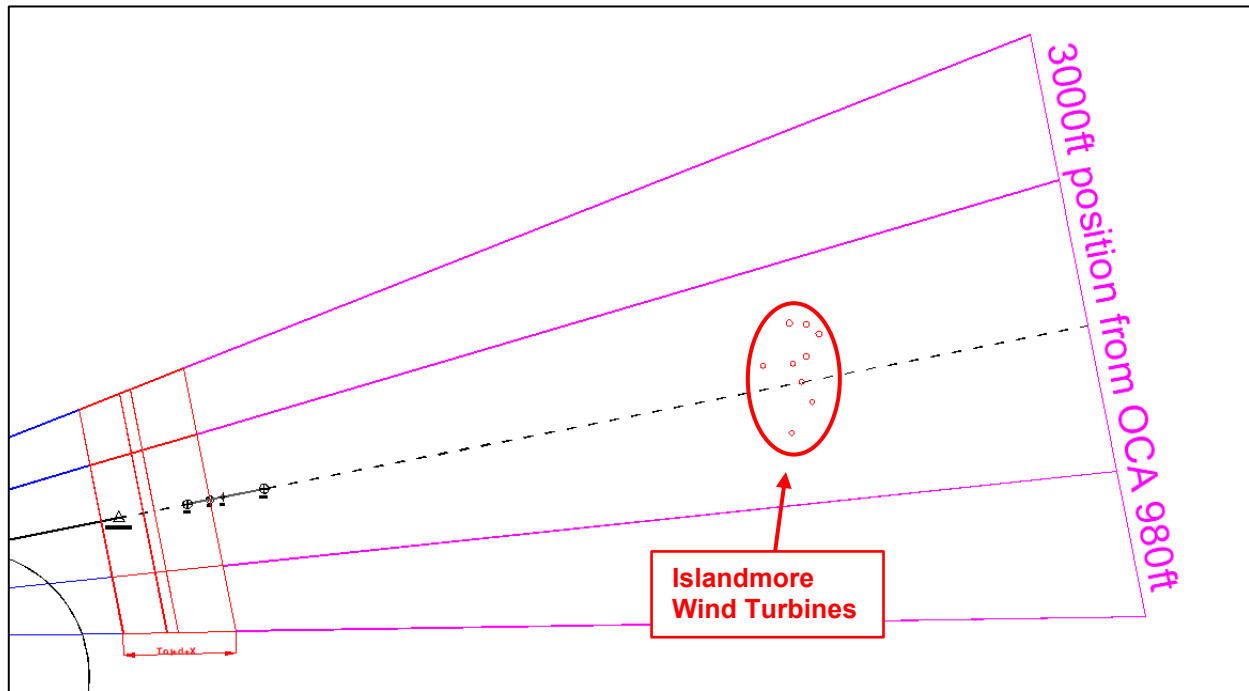
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The NDB radial tolerance was constructed using the following parameters:

Navigational Aid	
Type	NDB
ID	KNK
Latitude	53°53'47.40"N
Longitude	008°56'13.20"W
Parameters	
Out-bound Track	083 °
Distance to Start	0 nm
Distance to Finish	17.38 nm
Tolerance Type	Area Splay

Parameters	
IAS	250 kts
TAS	272.3 kts
Altitude	4000 ft
ISA	15 °C
Bank Angle	15 °
Wind	30 kts (Custom)
r	7468.23 m
E	1292.47 m
$\sqrt{r^2 + E^2}$	7579.25 m
r + E	8760.7 m
r + 2E	10053.16 m
Orientation	
Track / Radial	083 °
Turn Direction	Right



As can be seen in the previous picture the proposed Islandmore Wind Turbines are located in the intermediate missed approach segment protection areas.

Intermediate missed approach

ID	Alt.	Area	MOC req.	Ac. alt. (ft)	Alt. req. (ft)	MACG (%)
Position T3	357.0	P	30	2387.4	1269.7	0.6

As can be seen in the previous table the proposed Islandmore Wind Turbines do not affect the intermediate missed approach segment of the NDB DME approach to runway 08.

The NDB approach to runway 08 is not affected by the proposed Islandmore Wind Turbines.

6. Risk Assessment

6.1 Risk Value Explanation

ASAP has used the values from guidelines laid out in the ICAO Safety Management Manual (SMM), document 9859, Chapter 2. *Safety management fundamentals*.

The following table from the Safety Management Manual details the ICAO terms describing the severity of a safety risk.

Table 2. Example Safety Risk Severity Table

Severity	Meaning	Value
Catastrophic	- Equipment destroyed. - Multiple deaths.	A
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 - Major equipment damage.	B
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.	C
Minor	- Nuisance. - Operating limitations. - Use of emergency procedures. - Minor incident.	D
Negligible	Few consequence	E

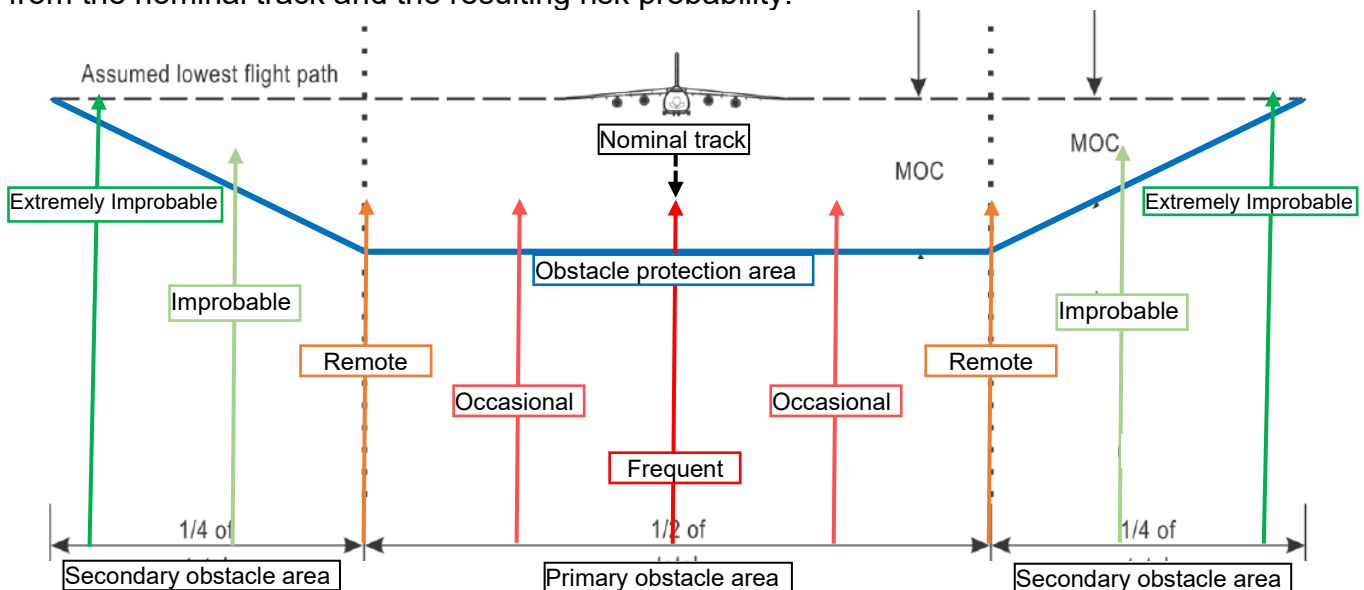
This special aeronautical study assesses the safety risk of an aircraft collision with the proposed Islandmore Wind Turbines. Therefore, it follows that the severity of this event would be Catastrophic (A).

The following table from the Safety Management Manual details the ICAO terms describing the safety risk probabilities.

Table 1. Safety Risk Probability Table

ICAO Definition	Meaning	Value
Frequent	Likely to occur many times	5
Occasional	Likely to occur sometimes	4
Remote	Unlikely, but possible to occur	3
Improbable	Very unlikely to occur	2
Extremely improbable	Almost inconceivable that the event will occur	1

To enable a risk probability for a proposed structures, without a previous history, to be determined ASAP has combined the position of the structure with the relevant 3-dimensional ICAO Pans-Ops obstacle protection areas. Using the premise that the closer a structure, that penetrates the obstacle protection area, is to the nominal aircraft track the higher the collision risk probability (1-5). The following diagram shows the relationship between the distance a proposed structures is from the nominal track and the resulting risk probability.



II-1-1-1. Relationship of minimum obstacle clearances in primary and secondary areas in cross-section

6.2 Safety Risk Probability

Procedure	NIL	Improbable+	Improbable	Remote	Occasional	Frequent
Annex 14 Runway 08 / 26	0					
MSAs	0					
Holding patterns	0					
Visual Circling	0					
SIDs Runway 26	0					
SIDs Runway 08	0					
LNAV Runway 26	0					
LNAV/VNAV Runway 26	0					
LPV200 Runway 26	0					
ILS Z Runway 26	0					
ILS Y Runway 26	0					
LOC Only Z Runway 26	0					
LOC Only Y Runway 26	0					
VOR Runway 26	0					
NDB Runway 26	0					
LNAV Runway 08	0					
LNAV/VNAV Runway 08	0					
LPV200 Runway 08	0					
VOR Runway 08	0					
NDB Runway 08	0					
Total Assessed Risk Probability Value		0			No Risk	

The Islandmore Wind Turbines have been assessed as not to be a safety risk to flight operations at Ireland West / Knock airport.

7. Conclusion

The Islandmore Wind Turbines will not affect the flight procedures at Ireland West / Knock airport.

8. Appendix 1 – Procedures Checked

Runway 08	
Procedure	Status
Annex 14	OK
Visual Circling	OK
All MSAs	OK
All Holdings	OK
Departure – TUVPU 1A	OK
Departure – WOWEC 1A	OK
LNAV	OK
LNAV/VNAV A	OK
LNAV/VNAV B	OK
LNAV/VNAV C	OK
LNAV/VNAV D	OK
LPV200 A	OK
LPV200 B	OK
LPV200 C	OK
LPV200 D	OK
VOR	OK
NDB	OK

Runway 26	
Procedure	Status
Annex 14	OK
Visual Circling	OK
All MSAs	OK
All Holdings	OK
Departure – ELGUX 1B	OK
Departure – ORFOD 1B	OK
Departure – PIXIB 1B	OK
LNAV	OK
LNAV/VNAV A	OK
LNAV/VNAV B	OK
LNAV/VNAV C	OK
LNAV/VNAV D	OK
LPV200 A	OK
LPV200 B	OK
LPV200 C	OK
LPV200 D	OK
ILS Z_CAT I_A	OK
ILS Z_CAT I_B	OK
ILS Z_CAT I_C	OK
ILS Z_CAT I_D	OK
ILS Z_CAT II_A	OK
ILS Z_CAT II_B	OK
ILS Z_CAT II_C	OK
ILS Z_CAT II_D	OK
LOC Only Z	OK
ILS Y_CAT I_A	OK
ILS Y_CAT I_B	OK
ILS Y_CAT I_C	OK
ILS Y_CAT I_D	OK
ILS Y_CAT II_A	OK
ILS Y_CAT II_B	OK
ILS Y_CAT II_C	OK
ILS Y_CAT II_D	OK
LOC Only Y	OK
VOR	OK
NDB	OK

9. End of Document



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