

Morecambe Offshore Windfarm: Generation Assets Environmental Statement

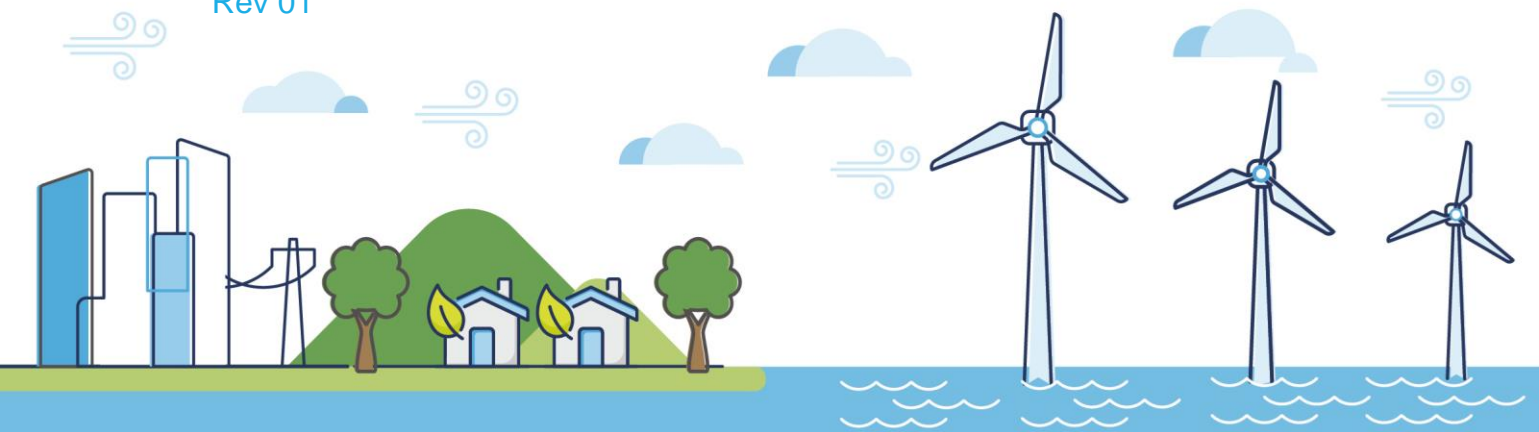
Volume 5

Appendix 16.2 Blackpool Instrument Flight Procedure Safeguarding Report

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IFP Safeguarding
Morecambe Wind Farm
Blackpool Airport

09 October 2023

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V1.0	Initial Issue	29 August 2023	Issue
V1.1	Figure 1 updated, added Figure 7	04 October 2023	Issue
V1.2	RNP RWY 28 Assessment Corrected	09 October 2023	Issue

Executive Summary

Royal Haskoning DHV (The Client), has requested Cyrrus to conduct an Instrument Flight Procedure (IFP) safeguarding assessment of a proposed Windfarm, approximately 16.6 NM to the west of Blackpool Airports ARP.

The purpose of this assessment is to determine if the proposed windfarm infringes upon the protection areas/surfaces of the IFPs serving the Airport. These protection areas and surfaces (sloping or level) are established based upon the runway (RWY) and thresholds, ARP, clearways, ground navigation equipment, and established waypoints.

The proposed windfarm does impact the IFP currently published at Blackpool Airport.

The mitigation options required are detailed further in the conclusion.

Overview

The proposed Wind Farm is located approximately 16.6 NM to the west of Blackpool Airports ARP, as depicted in Figure 1.

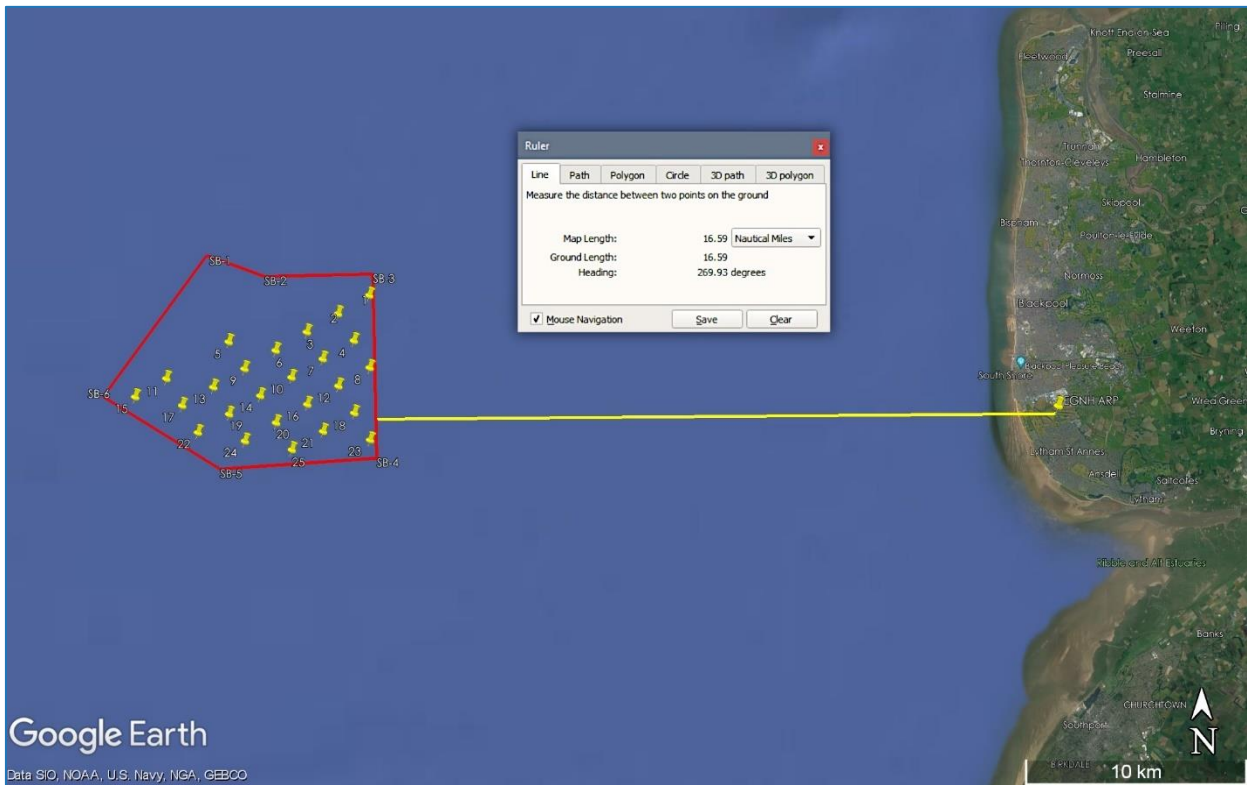


Figure 1: Obstacle Position from ARP

IFP's Assessed

The following IFPs, as published in the UK Aeronautical Information Publication (AIP) were assessed.

- INSTRUMENT APPROACH CHART NDB(L)/DME RWY 10 (AD 2.EGNH-8-1)
- INSTRUMENT APPROACH CHART NDB(L) RWY 10 (AD 2.EGNH-8-2)
- INSTRUMENT APPROACH CHART ILS/DME RWY 28 (AD 2.EGNH-8-3)
- INSTRUMENT APPROACH CHART LOC/DME RWY 28 (AD 2.EGNH-8-4)
- INSTRUMENT APPROACH CHART RNP RWY 28 (AD 2.EGNH-8-1)

Data

The following data was received from the Client for the purpose of this assessment:

- Turbine positions in: '507401-MOR-ODE-LY-SI-0002-REV 0.pdf'
- Site Positions in: 'FLO-MOR-GIS-MAP008-Morecambe Revised-Rev001.png'
- Turbine Elevations in: 'FW_ Morecambe design info.msg'

At the time of conducting this assessment the turbine layout had not been finalized. The site boundary including the 25 Wind Turbine Generators (WTGs) were assessed at maximum turbine tip elevation of 315 m (AMSL) and rotor diameter of 140 m as indicated in Table 1.

The wind turbine and site boundary coordinates were supplied in Universal Transverse Mercator (UTM) no coordinate reference system conversion was required.

Obstacle (No/Name)	Easting (UTM 30)	Northing (UTM 30)	Lat (WGS84)	Long (WGS84)
WTG 1	467122	5963322	53°49'2.66"N	3°29'57.82"W
WTG 2	465716	5962510	53°48'36.06"N	3°31'14.37"W
WTG 3	464309	5961698	53°48'9.44"N	3°32'30.95"W
WTG 4	466416	5961298	53°47'57.01"N	3°30'35.63"W
WTG 5	460796.0	5961287.0	53°47'55.23"N	3°35'42.78"W
WTG 6	462903.0	5960886.0	53°47'42.82"N	3°33'47.45"W
WTG 7	465009.0	5960486.0	53°47'30.40"N	3°31'52.19"W
WTG 8	467116.0	5960085.0	53°47'17.92"N	3°29'56.90"W
WTG 9	461496.0	5960074.0	53°47'16.18"N	3°35'03.98"W
WTG 10	463603.0	5959674.0	53°47'03.78"N	3°33'08.68"W
WTG 11	457984.0	5959663.0	53°47'01.90"N	3°38'15.67"W
WTG 12	465709.0	5959273.0	53°46'51.32"N	3°31'13.46"W
WTG 13	460090.0	5959262.0	53°46'49.52"N	3°36'20.42"W
WTG 14	462196.0	5958862.0	53°46'37.14"N	3°34'25.19"W
WTG 15	456577.0	5958851.0	53°46'35.21"N	3°39'32.13"W
WTG 16	464303.0	5958461.0	53°46'24.70"N	3°32'29.93"W
WTG 17	458684.0	5958450.0	53°46'22.85"N	3°37'36.84"W
WTG 18	466409.0	5958061.0	53°46'12.27"N	3°30'34.74"W
WTG 19	460790.0	5958050.0	53°46'10.50"N	3°35'41.63"W
WTG 20	462896.0	5957649.0	53°45'58.08"N	3°33'46.43"W
WTG 21	465003.0	5957249.0	53°45'45.66"N	3°31'51.20"W
WTG 22	459384.0	5957238.0	53°45'43.84"N	3°36'58.03"W
WTG 23	467109.0	5956849.0	53°45'33.21"N	3°29'56.04"W
WTG 24	461490.0	5956837.0	53°45'31.44"N	3°35'02.85"W
WTG 25	463596.0	5956437.0	53°45'19.04"N	3°33'07.69"W
Site Boundary 1	455083.5	5959197.0	53°46'45.96"N	3°40'53.89"W
Site Boundary 2	460347.5	5955899.0	53°45'00.78"N	3°36'04.80"W
Site Boundary 3	467427.5	5956340.0	53°45'16.82"N	3°29'38.46"W
Site Boundary 4	467310.7	5964634.0	53°49'45.15"N	3°29'48.00"W
Site Boundary 5	462415.8	5964565.0	53°49'41.73"N	3°34'15.69"W
Site Boundary 6	459937.7	5965491.0	53°50'11.04"N	3°36'31.66"W

Table 1: Data used for Assessment

IFP Safeguarding Assessment

An IFP Safeguarding assessment was completed against the applicable procedures for Runway 10 / Runway 28 at Blackpool Airport.

Due to the technical nature of the information, this report is a distillation of the IFP modelling and subsequent assessment of the obstacles, the full data set is available if required¹. The purpose of this report is to identify what procedures were assessed and whether there is an impact, in the event of an impact, potential mitigation is provided². Where an impact was identified, only the assessment of the respective segment for said procedure, is provided.

The IFPs were assessed using the following software and version : PHX 21.0.2.11825.

Table 2 provides an impact summary of all the IFPs that were assessed.

Assessed Procedure	RWY	Impact	Comments
MSAs NDB(L) BPL	Both	Yes	See conclusion.
Visual Circling (Total Area)		No	Nil.
Visual Circling (South of RWY 10/28)		No	Nil.
NDB(L)/DME	10	No	Nil.
NDB(L)		Yes	See conclusion.
ILS/DME/NDB(L)	28	No	Nil.
LOC/DME/NDB(L)		No	Nil.
RNP		Yes	Impact to TAA, See conclusion.
NDB(L)/DME		No	Nil.

Table 2: IFP Assessment Impact Summary

Minimum Sector Altitude (MSA) NDB(L) BPL

The MSA predicated on NDB(L) BPL. It is common to several IFPs currently published at Blackpool Airport. The Impacted procedures are:

- NDB(L)/DME RWY 10 (AD 2.EGNH-8-1)
- NDB(L) RWY 10 (AD 2.EGNH-8-2)
- ILS/DME RWY 28 (AD 2.EGNH-8-3)
- LOC/DME RWY 28 (AD 2.EGNH-8-4)
- NDB(L)/DME RWY 28 (AD 2.EGNH-8-6)

¹ Please note that the full data set can run into an excess of 20 pages per procedure and can only be decoded by those familiar with the output generation from the IFP Software and trained IFP Designers.

² Mitigation for the IFPs is for the Airport (Sponsor) to decide upon as these may have a direct impact on their operations. It is recommended that further discussion and guidance is obtained from the CAA.

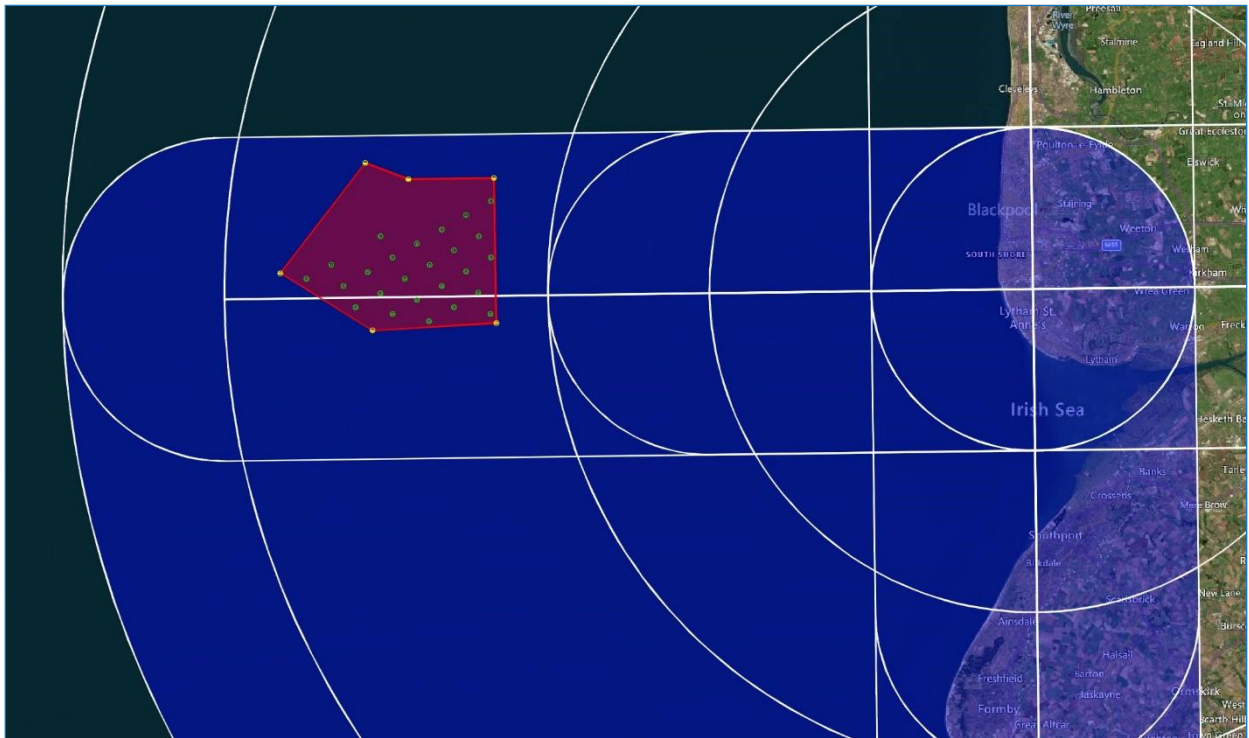


Figure 2: MSA NDB(L) BPL Obstacle Protection Area

The proposed wind farm impacts the 25 NM Sector between 360° and 090° QDM of the MSA.

The maximum elevation of the proposed windfarm development is at 315 m including a minimum obstacle clearance (MOC) of 300 m results in a MOCA of **2017.7 ft** rounded to **2100 ft**.

Mitigation for the airport to consider is to increase the impacted sector altitude from 2000 ft to 2100 ft.

Mitigation for the developer to consider is to restrict the turbine tip elevation to 309.6 m AMSL for all wind turbines.

NDB RWY 10 Initial Approach via Base Turn CAT C/D

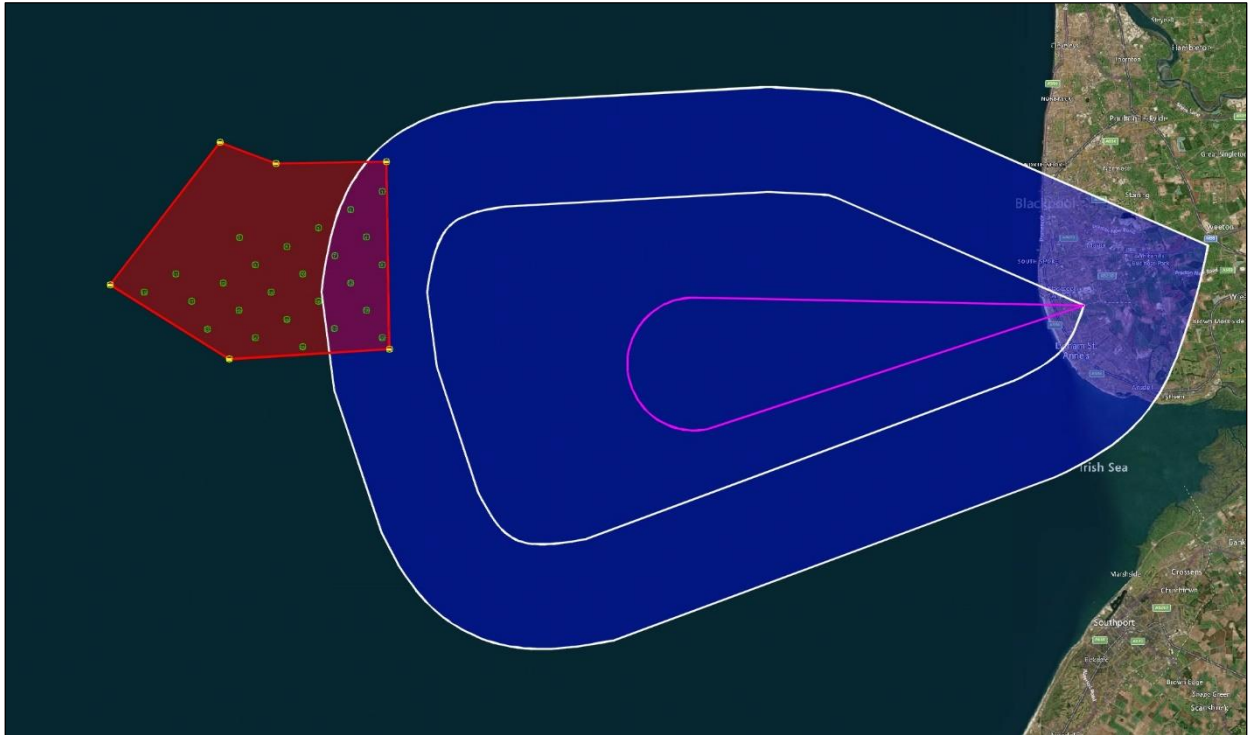


Figure 3: NDB(L) RWY 10 Initial Approach Base Turn

Name	Latitude	Longitude	Alt. (m)	Area	Dist. (m)	in	MOC (m)	MOCA (ft)
8	53°47'17.92"N	003°29'56.90"W	315.0	Secondary	1720.6		188.5	1652.0
SB-4	53°45'16.82"N	003°29'38.46"W	315.0	Secondary	1783.1		184.5	1638.7

Figure 4: Initial Approach Base Turn CAT C/D Obstacle Assessment

The proposed wind farm impacts the base turn for CAT C/D aircraft. The MOCA is 1625.0 ft rounded to 1700 ft for promulgation. The increased MOCA as a result will impact the descent gradient of the final approach procedure.

The possible mitigation options for the airport to consider could be:

- Restrict the procedure to CAT A/B only.
- Redesign the procedure.
- Withdraw the procedure.

Mitigation for the developer to consider is to restrict the turbine tip elevation of WTG 8 to 299.1 m AMSL and SB-4 to 303.1 m AMSL.

NDB RWY 10 Initial Approach via Extended Hold CAT C/D

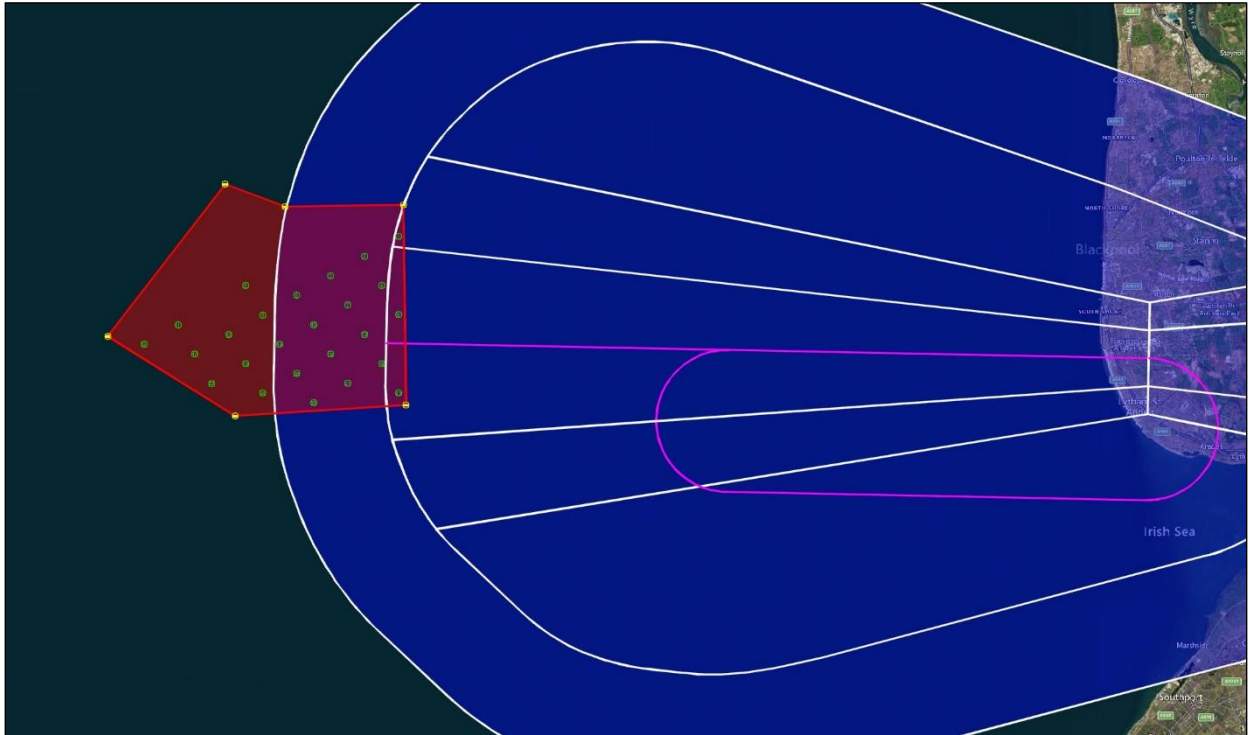


Figure 5: NDB(L) RWY 10 Initial Approach Racetrack

Name	Latitude	Longitude	Alt. (m)	Area	Dist. (m)	in	MOC (m)	MOCA (ft)
SB-3	53°49'45.15"N	003°29'48.00"W	315.0	Primary	N/A		300.0	2017.8
SB-4	53°45'16.82"N	003°29'38.46"W	315.0	Primary	N/A		300.0	2017.8
1	53°49'02.66"N	003°29'57.82"W	315.0	Primary	N/A		300.0	2017.8
8	53°47'17.92"N	003°29'56.90"W	315.0	Primary	N/A		300.0	2017.8
23	53°45'33.21"N	003°29'56.04"W	315.0	Primary	N/A		300.0	2017.8
18	53°46'12.27"N	003°30'34.74"W	315.0	Secondary	34.7		297.8	2010.4
4	53°47'57.01"N	003°30'35.63"W	315.0	Secondary	122.8		292.0	1991.7
12	53°46'51.32"N	003°31'13.46"W	315.0	Secondary	758.4		250.9	1856.6
2	53°48'36.06"N	003°31'14.37"W	315.0	Secondary	936.2		239.3	1818.7
21	53°45'45.66"N	003°31'51.20"W	315.0	Secondary	1424.5		207.7	1714.9
7	53°47'30.40"N	003°31'52.19"W	315.0	Secondary	1477.0		204.3	1703.8

Table 3: Initial Approach Racetrack CAT C/D Obstacle Assessment

The proposed wind farm impacts the Extended NDB(L) BPL hold for CAT C/D aircraft. The MOCA is 2017.8 ft rounded to 2100 ft for promulgation. The increased MOCA as a result with impact the descent gradient of the final approach procedure.

The possible mitigation options for the airport to consider could be:

- Restrict the procedure to CAT A/B only.
- Redesign the procedure.
- Withdraw the procedure.

The mitigation for the developer to prevent impact is to restrict the turbine tip elevations to an elevation not exceeding the values indicated in Table 4.

Name	Max Elevation (m AMSL)
WTG 1	187.7
WTG 2	248.4
WTG 4	195.7
WTG 7	283.3
WTG 8	187.7
WTG 12	236.7
WTG 18	189.8
WTG 21	279.9
WTG 23	187.7
Site Boundary 3	187.7
Site Boundary 4	187.7

Table 4: Turbine Max Tip Elevations Initial Approach Racetrack CAT C/D

NDB RWY 10 Final Approach

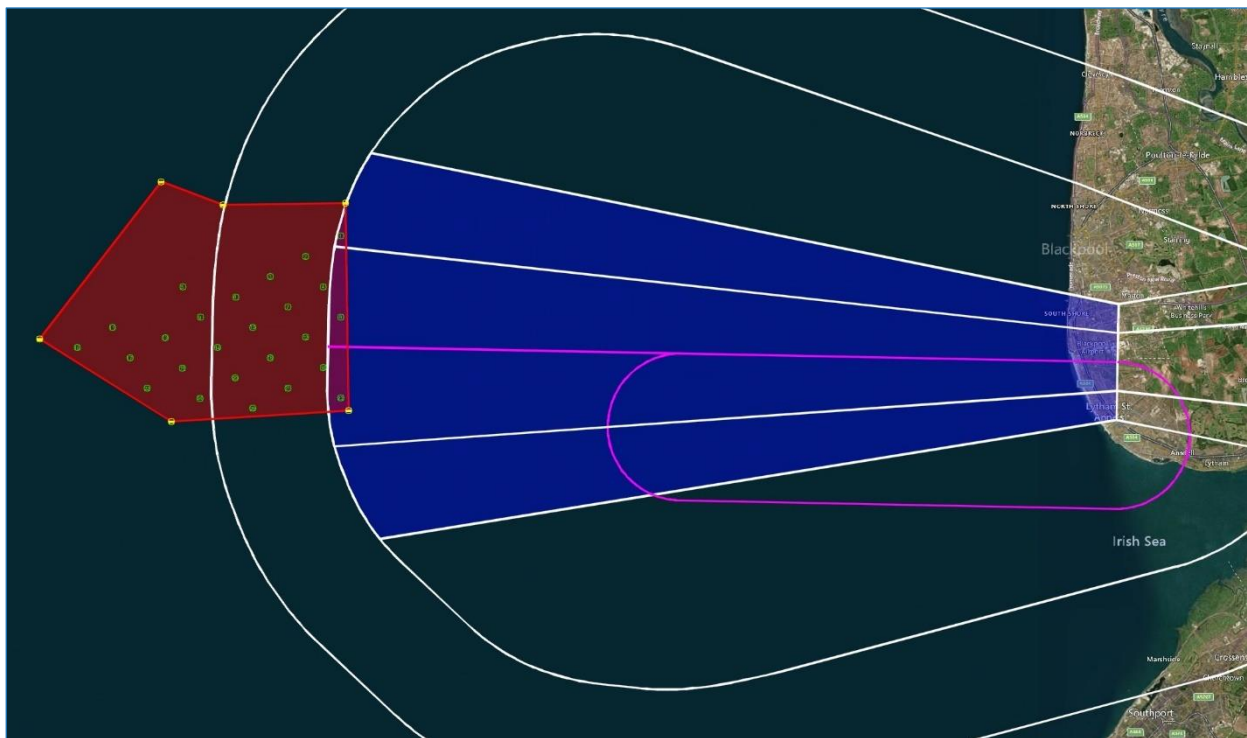


Figure 6: Final Approach CAT CD 2.5 min Extended Hold

Name	Latitude	Longitude	Alt. (m)	Area	Dist. in (m)	MOC (m)	OCA (ft)
8	53°47'17.92"N	003°29'56.90"W	315.0	Primary	N/A	90.0	1328.8
23	53°45'33.21"N	003°29'56.04"W	315.0	Primary	N/A	90.0	1328.8
SB-4	53°45'16.82"N	003°29'38.46"W	315.0	Primary	N/A	90.0	1328.8

1	53°49'02.66"N	003°29'57.82"W	315.0	Secondary	302.2	83.2	1306.4
SB-3	53°49'45.15"N	003°29'48.00"W	315.0	Secondary	1632.4	53.0	1207.4

Table 5: NDB(L) RWY 10 Final Approach Obstacle Assessment

The proposed wind farm impacts the final approach for CAT C / D aircraft performing the procedure from the 2.5-minute extended NDB(L) BPL hold.

As indicated in Table 5, the Wind Farm would result in an OCA of 1328.8 ft rounded to 1330 ft for promulgation. This would be an increase of up to 880 ft above the currently published CAT C/D OCAs.

The possible mitigation options for the airport to consider could be:

- Restrict the procedure to CAT A/B only.
- Redesign the procedure.
- Withdraw the procedure.

The mitigation for the developer to prevent impact is to restrict the turbine tip elevations to an elevation not exceeding the values indicated in Table 6.

Name	Max Elevation (m AMSL)
WTG 1	53.9
WTG 8	47.1
WTG 23	47.1
WTG 24	84.1
WTG 25	47.1
Site Boundary 3	53.9
Site Boundary 4	47.1

Table 6: Turbine Max Tip Elevations Final Approach

RNP RWY 28

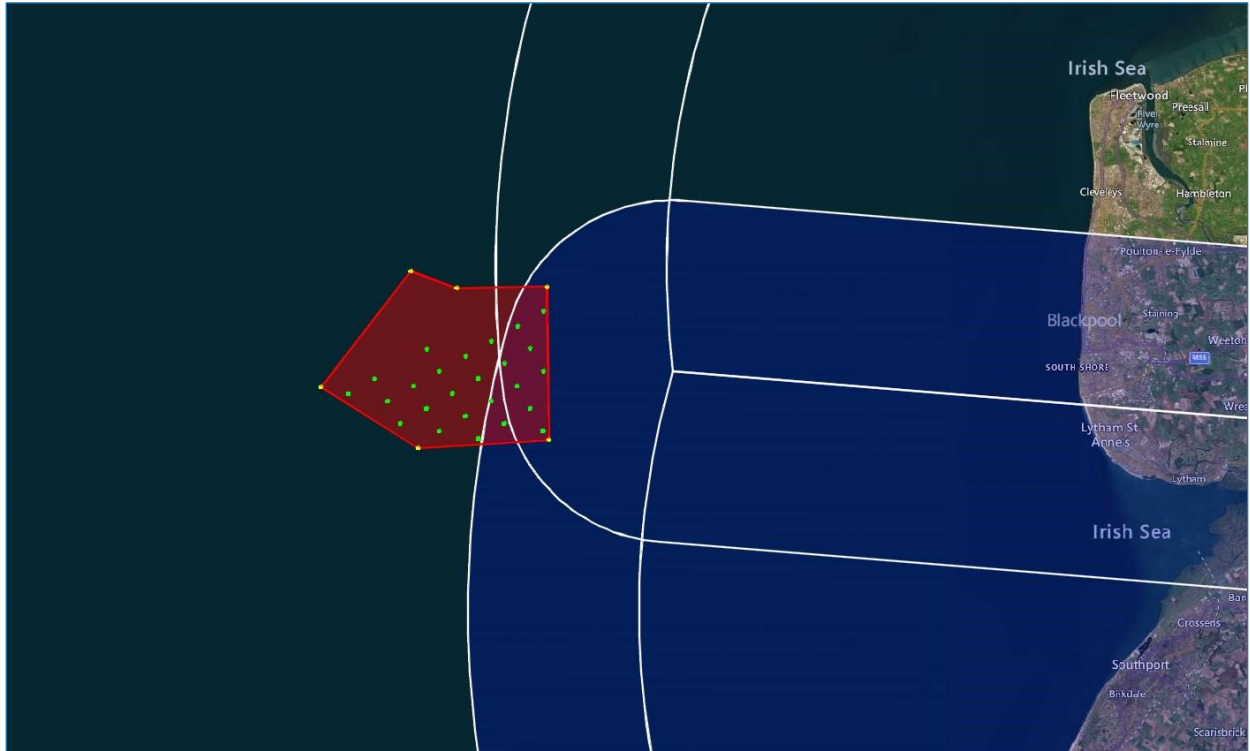


Figure 7: RNP RWY 28 TAA IAF ROBLU

Name	Latitude	Longitude	Alt. (m)	MOC (m)	MOCA (ft)
SB-3	53°49'45.15"N	003°29'48.00"W	315.0	300.0	2017.8
SB-4	53°45'16.82"N	003°29'38.46"W	315.0	300.0	2017.8
1	53°49'02.66"N	003°29'57.82"W	315.0	300.0	2017.8
2	53°48'36.06"N	003°31'14.37"W	315.0	300.0	2017.8
4	53°47'57.01"N	003°30'35.63"W	315.0	300.0	2017.8
7	53°47'30.40"N	003°31'52.19"W	315.0	300.0	2017.8
8	53°47'17.92"N	003°29'56.90"W	315.0	300.0	2017.8
12	53°46'51.32"N	003°31'13.46"W	315.0	300.0	2017.8
16	53°46'24.70"N	003°32'29.93"W	315.0	300.0	2017.8
18	53°46'12.27"N	003°30'34.74"W	315.0	300.0	2017.8
21	53°45'45.66"N	003°31'51.20"W	315.0	300.0	2017.8
23	53°45'33.21"N	003°29'56.04"W	315.0	300.0	2017.8

Table 7: RNP RWY 28 TAA IAWP ROBLU Checked Obstacles

The proposed wind farm impacts the RNP RWY 28 Terminal Arrival Altitude (TAA) predicated in the Initial Approach Fix (IAF) titled 'ROBLU'.

As indicated in Table 7, the Wind Farm would result in an MOCA of 2017.8 ft rounded to 2100 ft for promulgation. This is greater than the currently published MOCA of 1900 ft. The procedure altitude at

IAF ROBLU is at or above 3500 ft, therefore an increase to the MOCA for the TAA sector **would not** result in the requirement to redesign the procedure.

The possible mitigation options for the airport to consider could be:

- Increase the MOCA for the TAA predicated on IAF ROBLU from 1900 ft to 2100 ft.
- Implement a step-down to the effected TAA sector.

Mitigation for the developer to consider is to restrict the turbine tip elevation of the following to 279.1 m AMSL.

- SB-3
- SB-4
- WTG 1
- WTG 2
- WTG 4
- WTG 7
- WTG 8
- WTG 12
- WTG 16
- WTG 18
- WTG 21
- WTG 23

Conclusion

The assessment has been carried out against the proposed windfarm development approximately 16.6 Nautical Miles (NM) west from Black Pool's ARP.

The assessment has determined that the proposed windfarm does impact the currently published IFPs for Black Pool Airport. This impact is however limited to the published MSA NDB(L) BPL, IAF ROBLU TAA for RNP RWY 28 (AD 2.EGNH-8-1) and NDB RWY 10 (AD 2.EGNH-8-2).

This report considers two types of mitigation, the first is for the Developer to consider and the second for the Airport. Where mitigation is for the Airport's consideration, this will be subject to their Safety Management System (SMS) requirements and the commercial benefit of accepting the mitigation.

The mitigation for the developer to prevent impact is to restrict the turbine tip elevations to an elevation not exceeding the values indicated in Table 8, and graphically depicted in Figure 8.

Name	Max Elevation (m AMSL)
WTG 1	53.9
WTG 2	248.3
WTG 3	309.6
WTG 4	195.6
WTG 5	309.6
WTG 6	309.6

Name	Max Elevation (m AMSL)
WTG 7	279.1
WTG 8	47.1
WTG 9	309.6
WTG 10	309.6
WTG 11	309.6
WTG 12	236.7
WTG 13	309.6
WTG 14	309.6
WTG 15	309.6
WTG 16	279.1
WTG 17	309.6
WTG 18	189.8
WTG 19	309.6
WTG 20	309.6
WTG 21	279.1
WTG 22	309.6
WTG 23	47.1
WTG 24	309.6
WTG 25	309.6
Site Boundary 1	309.6
Site Boundary 2	309.6
Site Boundary 3	84.1
Site Boundary 4	47.1
Site Boundary 5	309.6
Site Boundary 6	309.6

Table 8: Turbine Max Tip Elevations

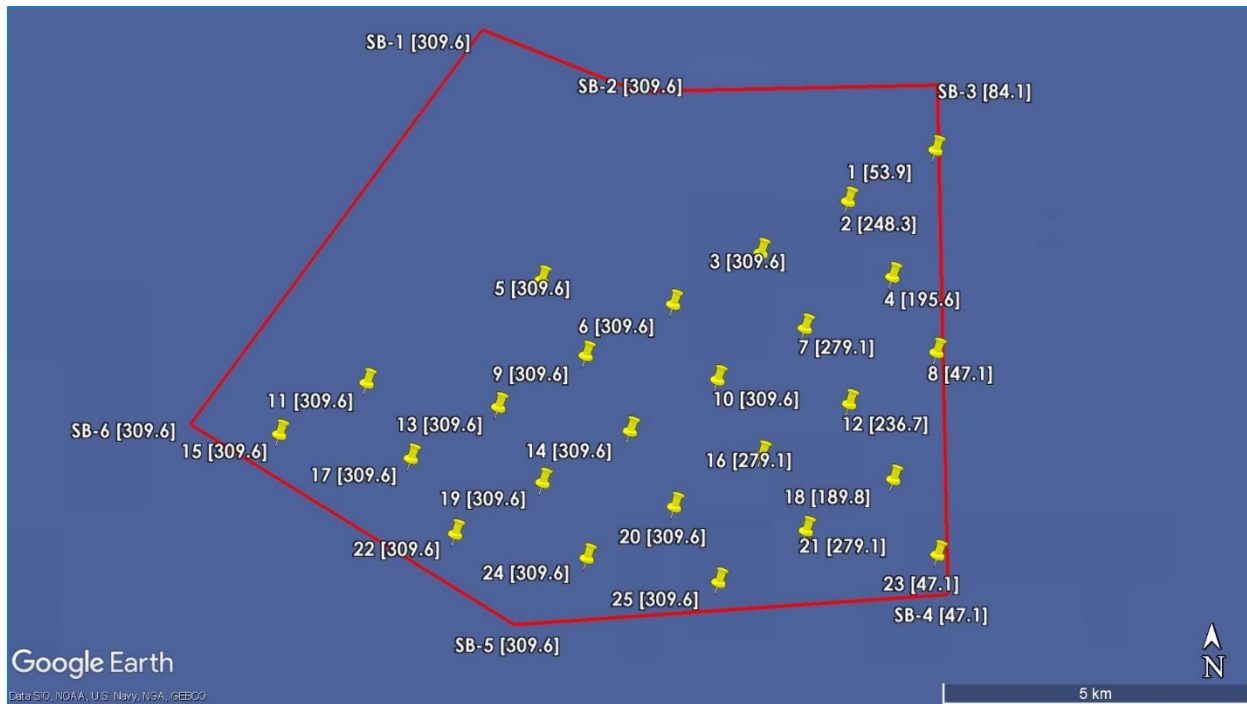


Figure 8: IFP Maximum Height Restrictions (m AMSL)

The mitigation for the Airport to consider are:

- MSA NDB(L) BPL
 1. Raise the applicable MOCA of the of the affected sectors (from 2000 ft to 2100ft), this option will be for the airport to consider.
- NDB(L) RWY 10
 1. Restrict the procedure to CAT A/B operations only.
 2. Redesign the procedure, this will require CAP 1616 requirements to be considered.
 3. Withdrawing (permanent nature) the impacted IFP can be considered prior consultation with Blackpool Airport and CAA.
- RNP RWY 28
 1. Increase the MOCA for the TAA predicated on IAF ROBLU from 1900 ft to 2100 ft.
 2. Implement a step-down to the effected TAA sector.



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