Cloud Hill Wind Farm

Technical Appendix 16.1 Aviation Screening Assessment

August 2023

Project No.: 0669769

The business of sustainability

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WIND BUSINESS SUPPORT

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CLOUD HILL

AVIATION SCREENING ASSESSMENT

A report for

BayWa r.e.

COMMERCIAL-IN-CONFIDENCE

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INTRODUCTION

Wind Business Support were commissioned by Baywa to review the level of planning risk associated with aviation impacts for their Cloud hill site.

This report presents the conclusions of an aviation screening assessment, the overall objective of which is to provide a high level review of all the potential impacts and associated risks. The purpose is to consider the full raft of potential issues affecting the MoD and civil aviation stakeholders to avoid unsighted objections arising in future. The report aims to provide some initial guidance on the project specific aviation issues, options and next steps as appropriate.

It is important to note that this is very much high level and not a full impact assessment. Whilst it should highlight issues that might affect the prospects for development and eliminate those that won't, some projects will require additional studies to fully assess potential conflicts.

Baywa Instructions
The scoping report based on 14 x 180 m turbines was lodged with the ECU earlier this month.

For context, I also attach the cumulative figure from scoping. Sanquhar 2 and Euchanhead both are in planning > 150m.

We are aiming for design in July, and it would be helpful to carry out an exercise in advance of this to establish if there are any aviation design considerations on turbine heights or locations that we should incorporate. We won't be going below 149.9 m and may end up at this height for other reasons but our starting point is 180 m.

Could you please identify the aviation constraints; any design considerations and overview of likely mitigation solutions.

SCOPE

The screening assessment covers all areas relating to aviation stakeholders, including the following.

1. Physical obstruction
    a. Through proximity to licensed and unlicensed aerodromes
    b. Infringement of Obstacle Limitation Surfaces
    c. Conflict with Instrument Flight Procedures
2. Radar impacts
    a. NERL primary and secondary radar
    b. Civil and military aerodrome air traffic control radar
    c. Military precision approach radar
    d. Military Air Defence radar
    e. Weather radar, operated by the UK Met Office
3. Proximity to other technical sites
    a. Navigational aids such as beacons, ILS
    b. Air-ground-air communications infrastructure operated by NATS En-Route
    c. Eskdalemuir seismological station
4. Proximity to military training areas
5. Airspace environment
6. Cumulative impacts
7. Potential for challenge or mitigation
    a. Impact significance, existing impacts, cumulative impacts
    b. Potential for mitigation through modification to operations
    c. Potential for mitigation through site layout or turbine tip height constraint
    d. Technical Radar Mitigation; from radar optimization to replacement
8. Mitigation cost estimates

SUMMARY

Risk Levels	Very High	High	Medium	Low	Very Low

Overall Development Risk	LOW	The site is low risk, though with a need to address the NATS Lowther Hill radar impacts.

ISSUES REGISTER

Stakeholder		Objection risk	Impact	Mitigation	Uncertainties
VL	NATS	Very High	Lowther Hill	Cumbernauld in-fill	Low
L	MOD	Low	Low Flying	Area constraint	Low
VL	Prestwick Airport*	High	IFP and radar	None required	Low

* Whilst there is no apparent substantive reason for an objection, it is likely that an objection will be registered against any submission initially, in order to force the developer address potential concerns.

MAIN ISSUES

Impacts to the NATS Lowther Hill radar will require mitigation, which is readily available.

Because the site is located within a high priority military low flying zone, it will come under close scrutiny by the MoD. However, given the local case history and the location away from the Nith valley centre, an objection appears unlikely.

The MoD may ask for visible spectrum lighting on cardinal turbines in addition to IR lighting on all perimeter turbines. This may be challengeable if turbines are under 150m tip height. For all tip heights of 150m+ obstacle lighting will be required.

Prestwick Airport will ask for an IFP impact assessment and may also ask for a radar impact assessment.

ASSESSMENT OVERVIEW

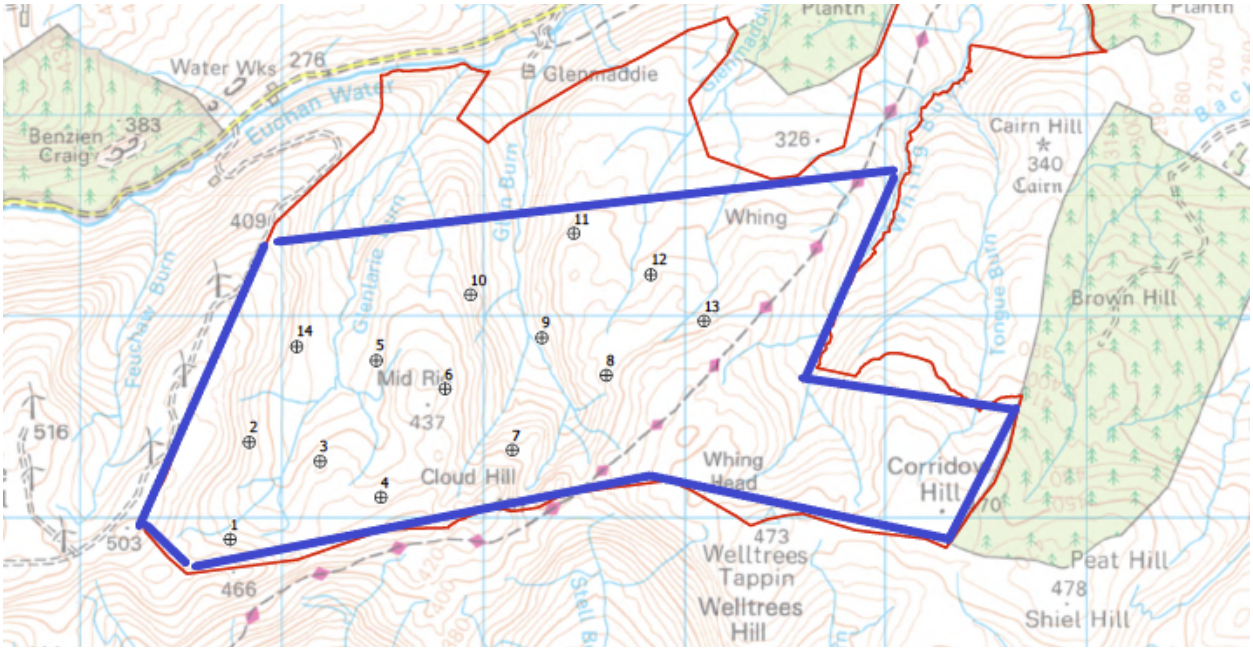
The table below provides a technical overview of the position against all the checks conducted within the assessment as described in the scope above.

Category	Potential Impacts	Mitigation Options
Aerodromes potentially affected	Prestwick (42km from main rwy ref)	Not applicable
Other relevant stakeholders	NATS En-route MOD	Not applicable
Physical Obstruction check	Clear	
Impacts to Flight Procedures (IAP, GNSS)	Within the GPA safeguarding zone	None expected to be required
Navaids (Radio beacons) check	Clear	
Air-Ground-Air Radio Comms check	Clear	
NERL Primary Surveillance Radar check	Highly visible to Lowther Hill radar	Cumbernauld in-fill or Indra
NERL Secondary Surveillance Radar check	Clear	
Civil Air Traffic Control Radar check	Clear	
Military Air Traffic Control Radar check	Clear	
Military Air Defence Radar check	Clear	
Military Precision Approach Radar check	Clear	
Weather Radar check	Clear	
Mod Low Flying check	Within TTA 20T high priority military low flying training area	Not expected to be required
Other (eg VLF, Eskdalemuir)	Just beyond the Eskdalemuir 50km radius safeguarding zone	Not required

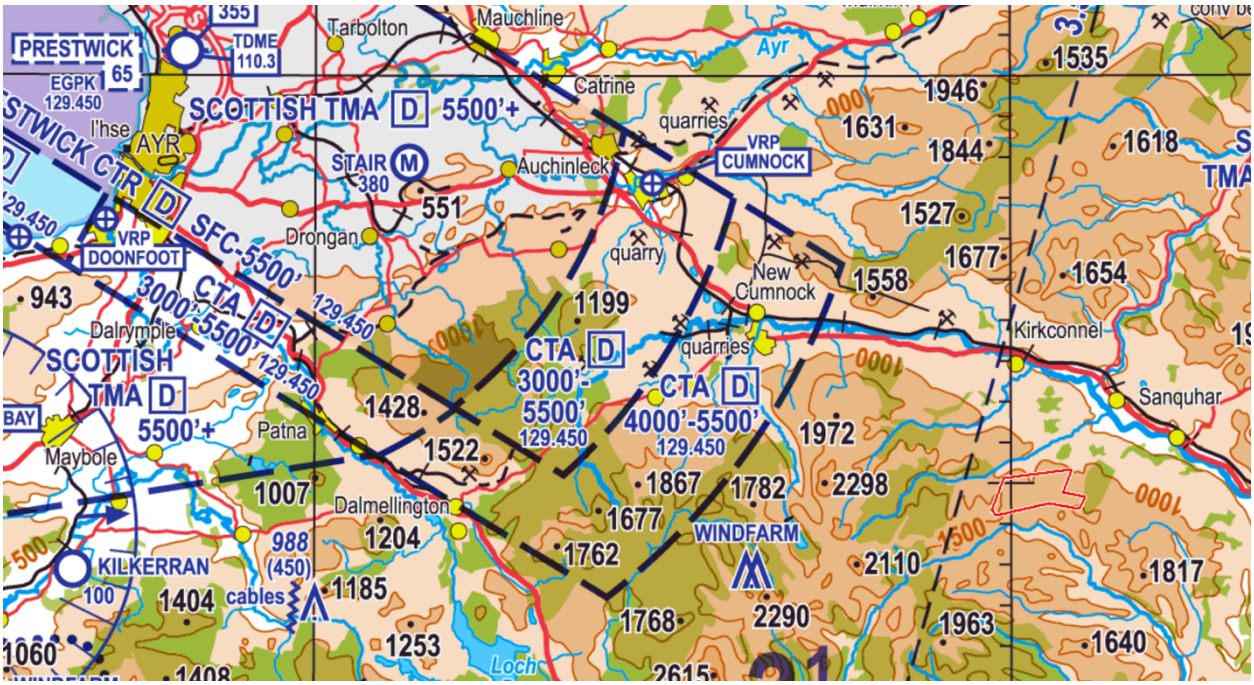
SITE DETAILS

April 2022

Up to 14 turbines with tip heights between 149.9m and 180m.



Development area boundary (blue) on client provided map

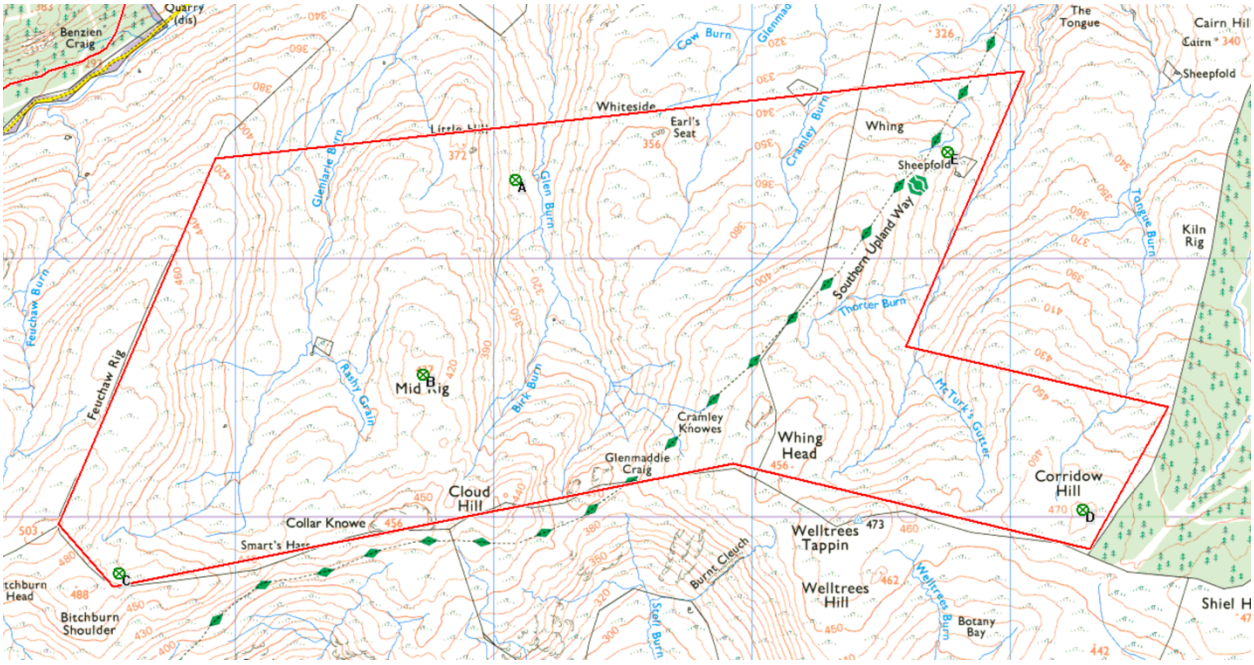


Site location on CAA Aviation chart

RADAR VISIBILITY

The table of results below has been derived from a radar Line of Sight (LoS) assessment, providing a good indication of the visibility of the proposed development to the radars potentially affected. In marginal cases, indicated by an orange highlight, more rigorous analysis is needed to determine visibility.

This section of the assessment only considers the potential for technical impacts and not their operational significance.



Map of locations assessed – sensitive high and low points across the site

Turbine	100km NGR	Ground elevation
A	NS 74084 06309	308
B	NS 73726 05555	437
C	NS 72549 04786	462
D	NS 76280 05032	470
E	NS 75757 06416	352

Location ID	Radar ID	Turbine tip height	Turbine base height	Radar to turbine	LOS visibility	LOS max tip height
		m agl	m AOD	km	m	m
A	Prestwick PSR	180	308	42.1	-208	388
B	Prestwick PSR	180	437	42.2	-147	327
C	Prestwick PSR	180	462	41.5	-89	269
D	Prestwick PSR	180	470	44.6	-97	277
E	Prestwick PSR	180	352	43.5	-134	314
A	Lowther Hill	150	308	15.6	115	35
C	Spadeadam DF	180	462	90.3	-134	314
D	Spadeadam DF	180	470	86.6	-186	366

INTERPRETATION OF RESULTS

The site is highly visible to the Lowther Hill radar at ranges from 13.5km. No other key radars are expected to be affected.

NOTES ON THE LINE OF SIGHT ASSESSMENT

Refraction arising from atmospheric variations is estimated by using a standard 4/3rds earth curvature radius model. This is the basis for determining the radar Line of Sight (***LoS***).

The assessment uses Ordnance Survey 10m elevation data, interpolated in order to derive the height of intermediate terrain. Accuracy is estimated on the basis of 2m errors in elevation at both radar and turbine.

Diffraction effects are not included, generated by the interaction of the radio waves with the terrain. Diffraction can have a very significant effect on the detectability of a turbine. It is taken into account in the assessments conducted by most aviation stakeholders including the NATS and the MoD. For this reason the LoS figures above should generally only be used as an initial indication of detectability with more detailed assessments required to gain a more robust result in many cases. Exceptions to this are where turbines are either very clearly visible or very clearly undetectable because of substantial terrain screening.

Whether or not a radar displays any detected objects also depends upon the settings and processing of the radar.

GLASGOW PRESTWICK AIRPORT (GPA)

No impacts are expected. There are no impacts to the radar and there appears to be no infringement of IFP safeguarding.

IFP IMPACTS

No IFP impacts are apparent, though it is likely that the airport will require an IFP impact assessment before approving development.

ATCSMAC (ATC Sector Minimum Altitude Chart)
The site is in an area with a Sector Minimum Altitude (SMA) of 3900ft. The maximum tip elevation that can occur at the site is 650m (470+180). The SMA required for this obstacle height is 3200ft. There is therefore no risk of infringing the current ATCSMAC.

Procedures
The site lies on the direct approach line to runway 30, close to the TRN hold at Lowest Altitude 6000ft. No procedures appear to vector ac over the site at less than 6000ft. The worst case tip elevation of the proposed development is 2132ft.

The operational Hare Hill wind farm has a maximum tip elevation of 2159ft, which is 658m. This is higher than the maximum tip elevation possible at the site for 180m tip height turbines.
The consented Whiteside Hill wind farm, immediately west of the site, has turbines of tip height 121m on ground of elevation up to 520m, giving tip elevations of up to approximately 640m.

NATS

NATS can be expected to object on the grounds of impacts to their Lowther Hill radar.

Note - Page 7 of 8 redacted as it contains commercially sensitive information.

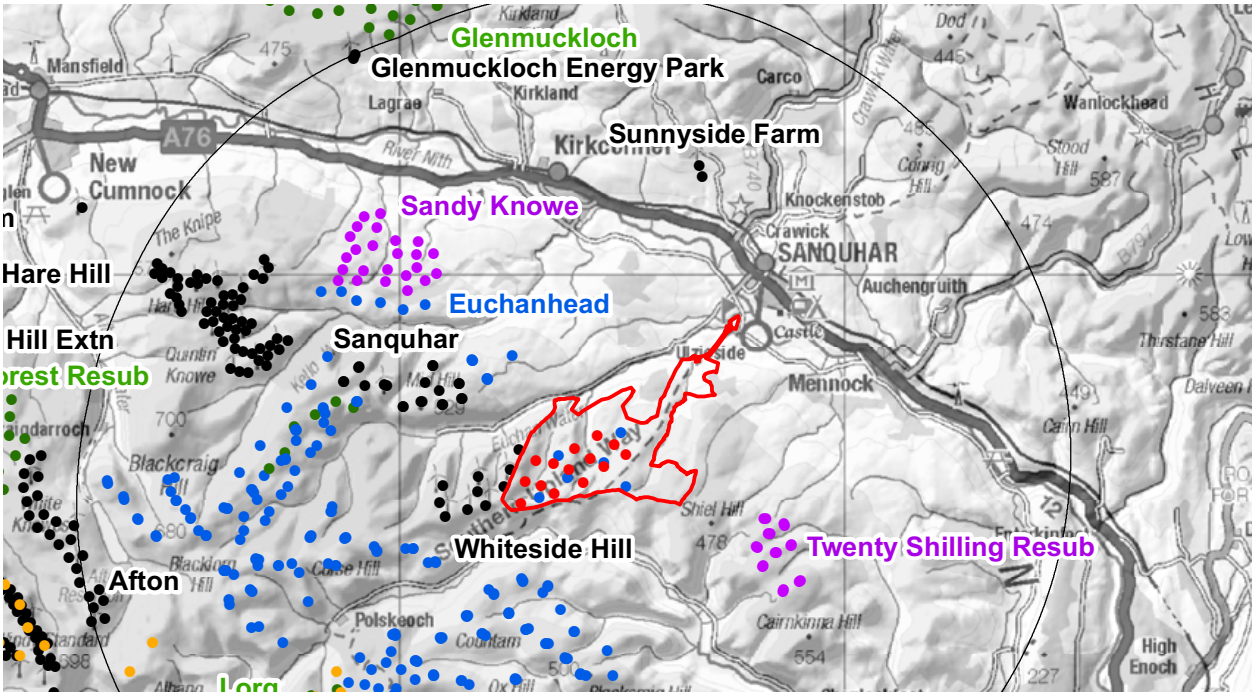
MOD

The only basis for objection would be the physical obstruction of low flying training within the Tactical Training Area.

LOW FLYING

Potential impacts are on contour flying or valley flying. The only apparent element remaining to be safeguarded is valley flying along the River Nith valley to the north.

The proposed development area does not appear to encroach further into the valley than the adjacent developments. The risk is therefore considered as at low risk of constraint. Further confidence could be gained by looking in detail at the Sandy Knowe extension application.



Client provided developments map

The MoD may ask for visible spectrum lighting on cardinal turbines in addition to IR lighting on all perimeter turbines.

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