# Technical Appendix 15.1: Aviation Lighting Assessment Report (Wind Farm Low Flying Aviation Consultants (WFLFAC)) dated 2 September 2025

# Wind Farm Low Flying Aviation Consultants Ltd

## Bhlaraidh Extension Turbine Site: Basic Lighting Report

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Date 02 September 2025

### Introduction

SSE have proposed the construction of an extension to the existing Bhlaraidh wind farm. The existing Bhlaraidh site is comprised of 32 turbines at 135m to tip height and is located 3km north west of Invermoriston on the northern banks of Loch Ness An earlier extension, to the immediate east of the main site, consisting of 15 turbines with tip heights of 180m, gained consent in 2022. The current extension proposal is now for 15 turbines at 230m tip height (Figure 1 below).

From a civilian aviation perspective, the Bhlaraidh Extension turbines will be located under uncontrolled airspace which is designated Class G by the CAA (open-unrestricted airspace). Conversely, from a military perspective, the turbines will be located in Low Flying Area (LFA) 14; the busiest LFA in the UK. Here, fast jet and tactical transport aircraft will operate down to 250ft and helicopters 100ft. Fortunately, the Bhlaraidh Extension is 10km outside the Highland Restricted Area (HRA) and Tactical Training Area (TTA) 14 where military fast jet, transport and helicopter aircraft fly at much lower operational heights.

In the hours of darkness (evening civil twilight to morning civil twilight) this area converts to Night Allocated Region (NAR) 1BE. Although primarily a fast jet training area, the airspace is also used by MOD and NATO tactical transport aircraft and helicopters for day and night training.

In addition, this area will be frequented by CSAR, Police, HEMs and Air Ambulance helicopters (Some operating from Inverness) as well as military aircraft by day and night. This type of activity will dictate that the site will require visible red and infra-red obstruction lighting on its turbines.

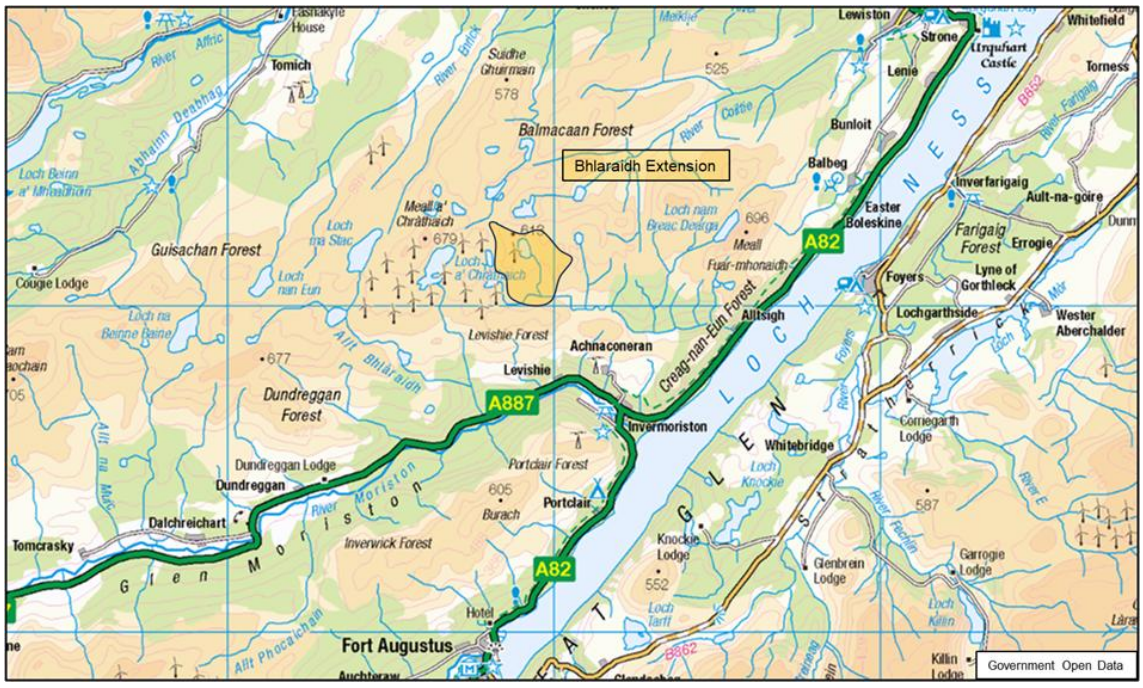


Figure 1: Bhlaraidh Extension Location

## Bhlaraidh Extension Wind Turbine Details

| Bhlaraidh Extension Turbine Table | | | | | | | |
|---|---|---|---|---|---|---|---|
| Turbine | Easting | Northing | Tip Ht | Turbine | Easting | Northing | Tip Ht |
| 1 | 238401 | 821692 | 230m | 10 | 239569 | 820831 | 230m |
| 2 | 238367 | 820992 | 230m | 11 | 238945 | 821306 | 230m |
| 3 | 238945 | 821833 | 230m | 12 | 240026 | 821464 | 230m |
| 4 | 239499 | 821334 | 230m | 13 | - | - | - |
| 5 | 239556 | 821951 | 230m | 14 | - | - | - |
| 6 | 238277 | 822170 | 230m | 15 | 240119 | 820823 | 230m |
| 7 | 238746 | 820686 | 230m | 16 | 239848 | 820102 | 230m |
| 8 | 238776 | 820250 | 230m | 17 | 240450 | 821190 | 230m |
| 9 | 239315 | 820040 | 230m | 18 | - | - | - |

Figure 2: Bhlaraidh Extension Turbine Details

## Starting Assumptions and Lighting Criteria

- Bhlaraidh Extension will be assessed as below/in Class G 'en-route' airspace insofar as visible obstruction lighting is concerned.
- Local airspace constraints will be considered for their potential impact on the site.
- Expected CAA and MOD dispensations will be assessed for the site.
- The visible lighting component of the lighting proposal will be developed in accordance with the latest (still draft) CAA CAP 764.
- To accommodate MOD requirements, and other lower airspace night operators, the site will be assessed for NVG compatible lighting in accordance with MOD published obstruction lighting specifications.
- Where possible, the recommended lighting configuration will be optimised to reduce light impact on the local area.
- The Bhlaraidh Extension wind turbine proposal is for fifteen wind turbines at 230m to tip.

## Future Proofing

The result of recent and on-going discussions with the CAA and MOD, regarding obstruction lighting requirements and pending changes to formal advice and guidance, will be incorporated into this briefing. This will be discussed in detail prior to the conclusion paragraph.

## Briefing Tone

This briefing has been kept as simple as possible only referencing the new detail that is necessary to validate the brief and not go over the extensive data trail associated with the original Bhlaraidh Site and its earlier 18 Turbine Extension Plan.

## CAA-ANO Red 2000/200cd Lighting

The CAA requires:

- That all 'string' perimeter (black dotted line) turbines be lit (hub and mid mast) unless removing a light will leave a gap of less than 900m total between the remaining lit turbines.
- That any turbine within 200m of a 'string perimeter' be lit unless the distance between adjacent turbines is less than 900m total.
- That any unlit turbine does not exceed a 10° up-slope from adjacent lit turbines.
- That any turbine is not more than 1800m from a lit turbine.

Applying these criteria, without expected dispensations, dictates that eleven turbines will require ANO lighting.

**Turbines with 2000/200cd Lights: T1, T2, T5, T6, T7, T8, T9, T12, T15, T16 and T17**

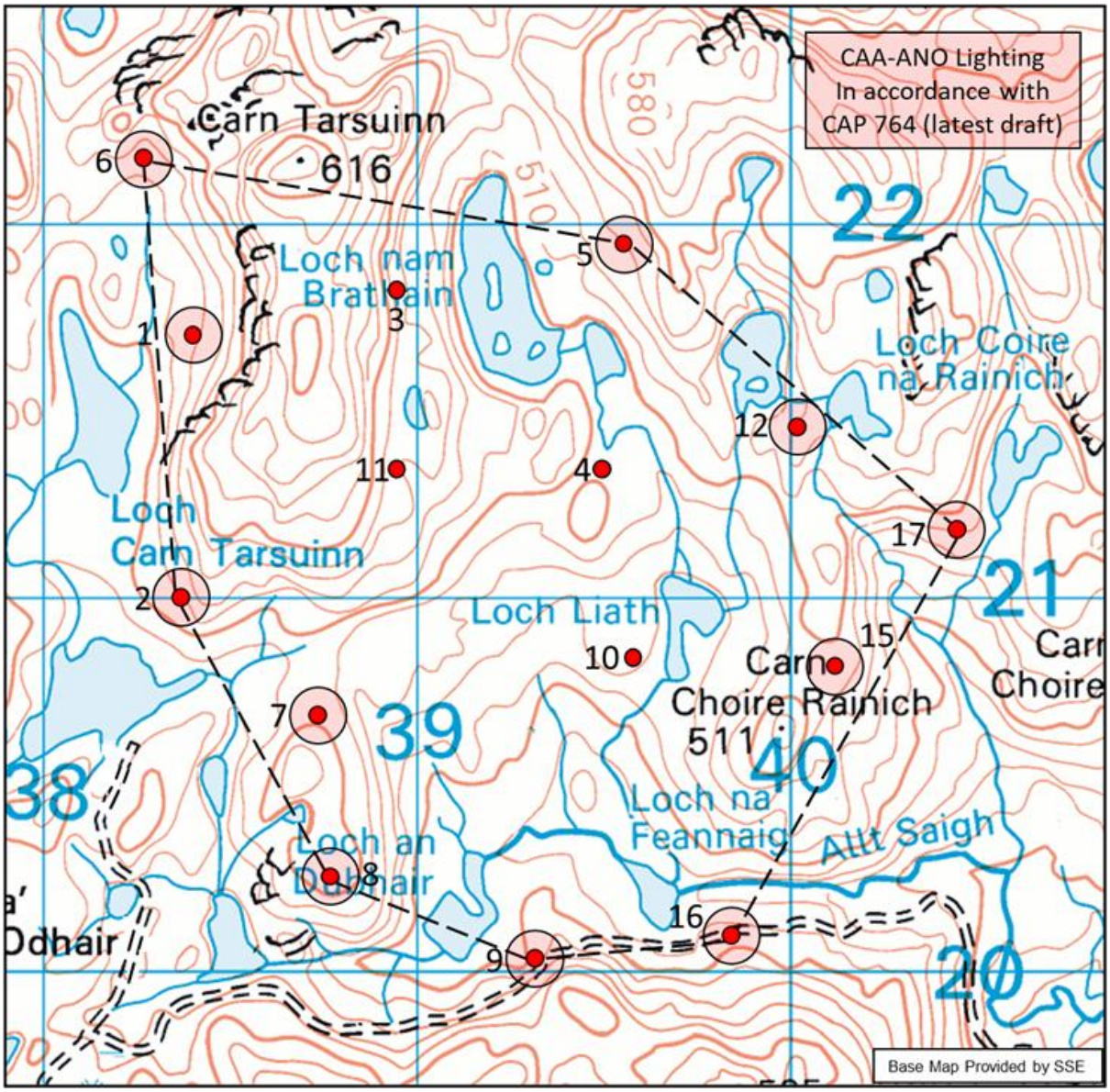



Figure 3: CAA-ANO Visible Red Lighting Requirements.

## CAA-ANO Red 2000/200cd Lighting – Reduced & Balanced Lighting Option

The military have operated at low level at night for many decades using night vision equipment. In more recent times, the last decade or so, more civilian operators have moved to night low level using suitable night vision equipment: night vision goggles (NVGs) etc. Such civilian operators include Coast Guard (CSAR), Police, Helicopter Emergency Medical Services (HEMS) and Air Ambulance.

Although, in the past, some night operators would fly at night at low level without night equipment (on carefully pre-planned exercises pre-flown by day) such events have been overtaken by the ever-widening use of night vision equipment. As a result, operators who now night fly, without night vision equipment, will fly at or above 'safety-altitude' when not under the guidance of Air Traffic Control.

Aircraft operating at safety-altitude or above, and depending upon the protocol adopted or phase of flight, the safety-altitude used will be 1000ft (300m), 1500ft (450m) or 2000ft (600m) above the local terrain/highest obstacle, this includes the turbine tip heights. Aircraft/helicopters flying as such, will only need enough visible lights to define the location of the wind farm and its size/shape/perimeter.

Accordingly, aircraft flying above the Bhlaraidh Extension turbines, at safety altitude or above, and/or under ATC direction (departing, approaching Inverness Airport) will only require an outline of the Bhlaraidh Extension site. Such a requirement could be identified on this extension site with five visible red lights on turbines T2, T5, T6, T9 and T17.

**Turbines with 2000/200cd Lights: T2, T5, T6, T9 and T17.**

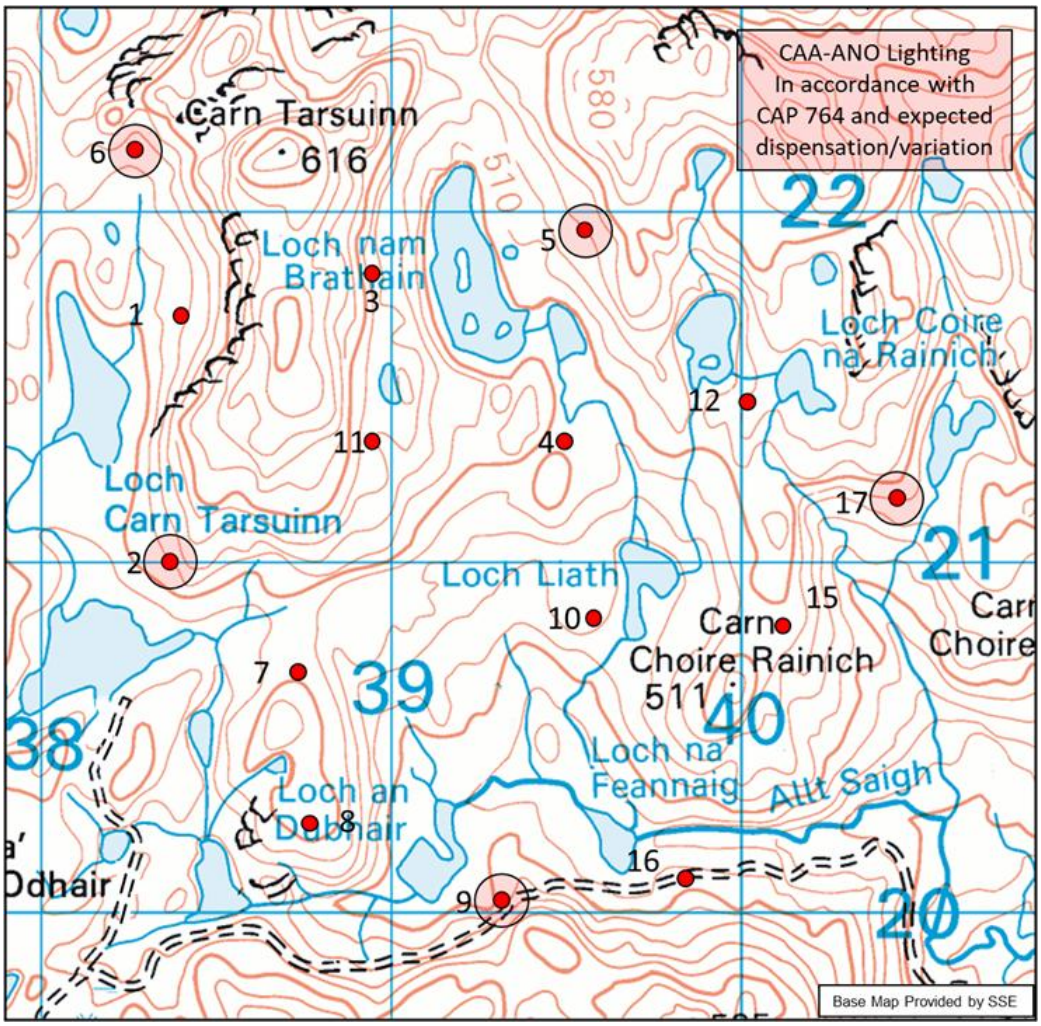



Figure 4: CAA-ANO Visible Red – Reduced and Balanced Lighting.

## CAA-ANO Red 2000/200cd Lighting – Further Reduced Lighting Option

In view that the earlier (18 x 180m) turbine extension was consented without visible lighting, a further reduction in lighting has been considered for this proposal, albeit with significantly larger turbines (15 x 230m).

A further reduced visible lighting proposal involving three visible lights is presented below. Whilst the three visible lights represent the approximate position of the turbine site, there are six turbines which sit outside the triangular perimeter formed by the lights. Informal talks with the CAA (not about this site or its details, but regarding significantly reduced lighting proposals in general) suggested such a lighting proposal may now not be approved.

The current and emerging factors that will influence lighting advice, guidance and even regulation will be covered in detail in a later paragraph. Nonetheless, the proposal below is added to this brief for consideration.

**Turbines with 2000/200cd Lights: T6, T8 and T17.**

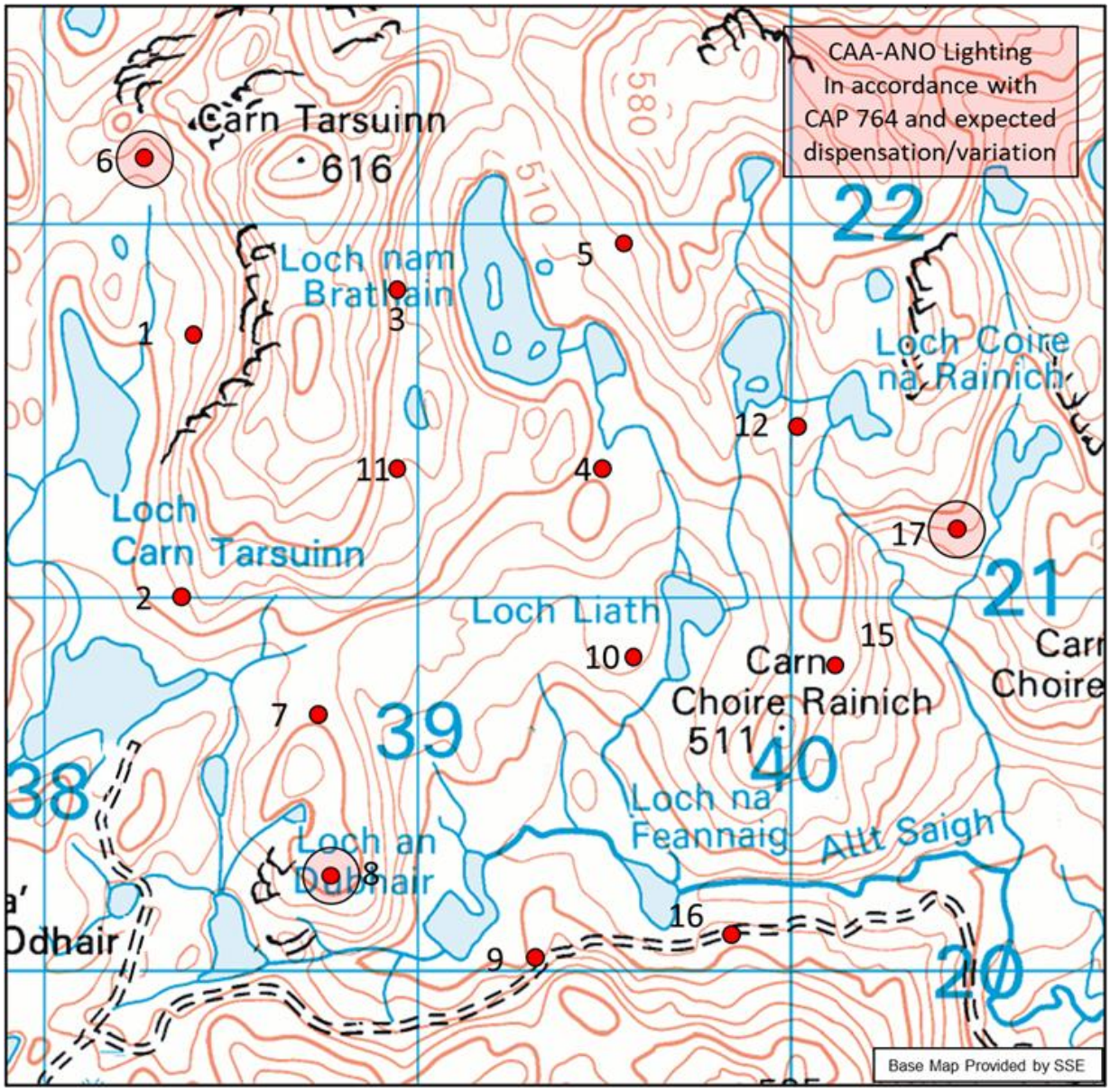



Figure 5: CAA-ANO Visible Red – Further Reduced Lighting.Proposal

## MOD IR Lighting

The MOD requires:

- That all 'compound-perimeter' turbines (see diagram blue dotted line) be lit unless removing a light will leave a gap of less than 500m between the remaining perimeter lit turbines.
- That any dominant turbine, by location or height be lit.
- Bhlaraidh Extension does not meet the MOD small site criteria (red dotted line) which caters for reductions to light numbers in certain conditions. Accordingly, central turbines will also be lit.

Applying these criteria dictates that all turbines of the Bhlaraidh Extension site will require IR lighting. Fifteen turbine lights in total.

**Turbines with Infra-Red Lighting: T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T15, T16 and T17.**

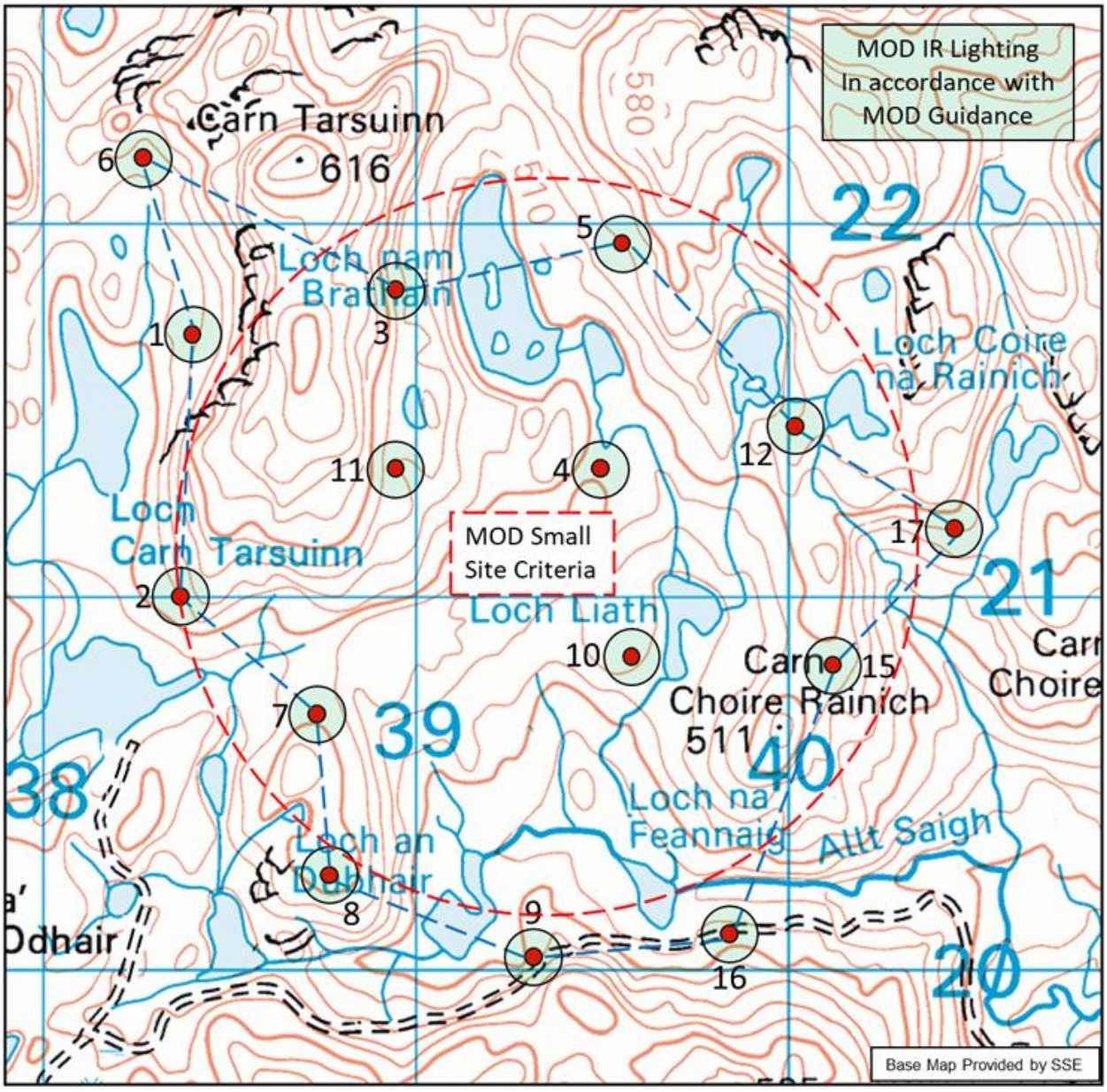



Figure 6: MOD IR Lighting Requirements.

## MOD IR-Lights and Night Vision Goggles/Devices (NVG/D)

The table above indicates that if following the MOD IR light guidance, all turbines will carry and IR light. This may not always be the case. NVG/Ds will automatically adjust their internal-gain if they 'see' a high density of IR light. This can be the case with large sites (many turbines) or small turbine sites (fewer lights but closer together). Turning down the gain prevents 'blooming and flare-up' of the image presented to the pilot/observer. However, turning down the gain means unlit objects fade into the background; this can be terrain, trees, hills etc; undesirable and clearly auto-gain-down is best avoided. Nonetheless, pilots/crews train to work with such events. Moreover, in the proliferation of IR lights now used to mark vertical structures in the low-level environment, this skill is a regularly practiced event. To sum-up, where there is a high concentration of IR lights, the MOD may request fewer IR lights, indicating which lights to remove. However, this type of request seems not to be issued in recent years and is not expected in relation to the Bhlaraidh Extension.

## CAA ANO and MOD IR Lighting Proposal for Bhlaraidh Extension (Table)

## Both the 5 visible light and 3 visible light Options are Shown

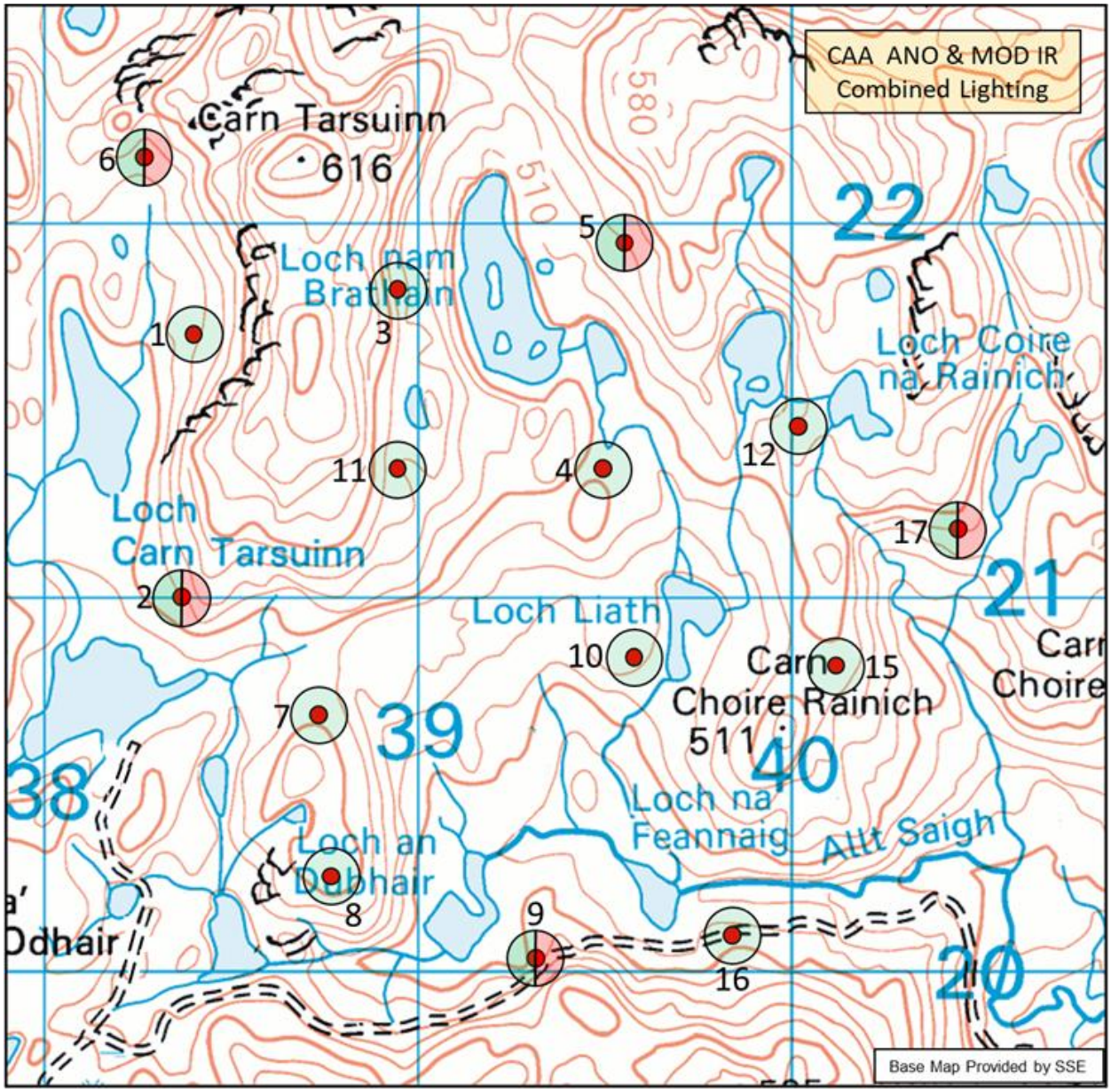
| Bhlaraidh Extension Turbine Lighting Table | | | | | | |
|---|---|---|---|---|---|---|
| Turbine | Easting | Northing | Tip Ht | CAA-ANO(5) | CAA-ANO(3) | MOD-IR |
| 1 | 238401 | 821692 | 230m | | | 600mW/sr |
| 2 | 238367 | 820992 | 230m | 2000/200cd | | 600mW/sr |
| 3 | 238945 | 821833 | 230m | | | 600mW/sr |
| 4 | 239499 | 821334 | 230m | | | 600mW/sr |
| 5 | 239556 | 821951 | 230m | 2000/200cd | | 600mW/sr |
| 6 | 238277 | 822170 | 230m | 2000/200cd | 2000/200cd | 600mW/sr |
| 7 | 238746 | 820686 | 230m | | | 600mW/sr |
| 8 | 238776 | 820250 | 230m | | 2000/200cd | 600mW/sr |
| 9 | 239315 | 820040 | 230m | 2000/200cd | | 600mW/sr |
| 10 | 239569 | 820831 | 230m | | | 600mW/sr |
| 11 | 238945 | 821306 | 230m | | | 600mW/sr |
| 12 | 240026 | 821464 | 230m | | | 600mW/sr |
| 13 | - | - | - | - | - | - |
| 14 | - | - | - | - | - | - |
| 15 | 240119 | 820823 | 230m | | | 600mW/sr |
| 16 | 239848 | 820102 | 230m | | | 600mW/sr |
| 17 | 240450 | 821190 | 230m | 2000/200cd | 2000/200cd | 600mW/sr |

Figure 7: Final Lighting Table.

## CAA ANO and MOD IR Lighting Proposal for Bhlaraidh Extension

## 5 Visible Light Proposal

Figure 8: Combined CAA ANO & MOD IR Lighting Proposal with 5 Visible & 15 IR Lights



## CAA ANO and MOD IR Lighting Proposal for Bhlaraidh Extension (Maps

## 3 Visible Light Proposal

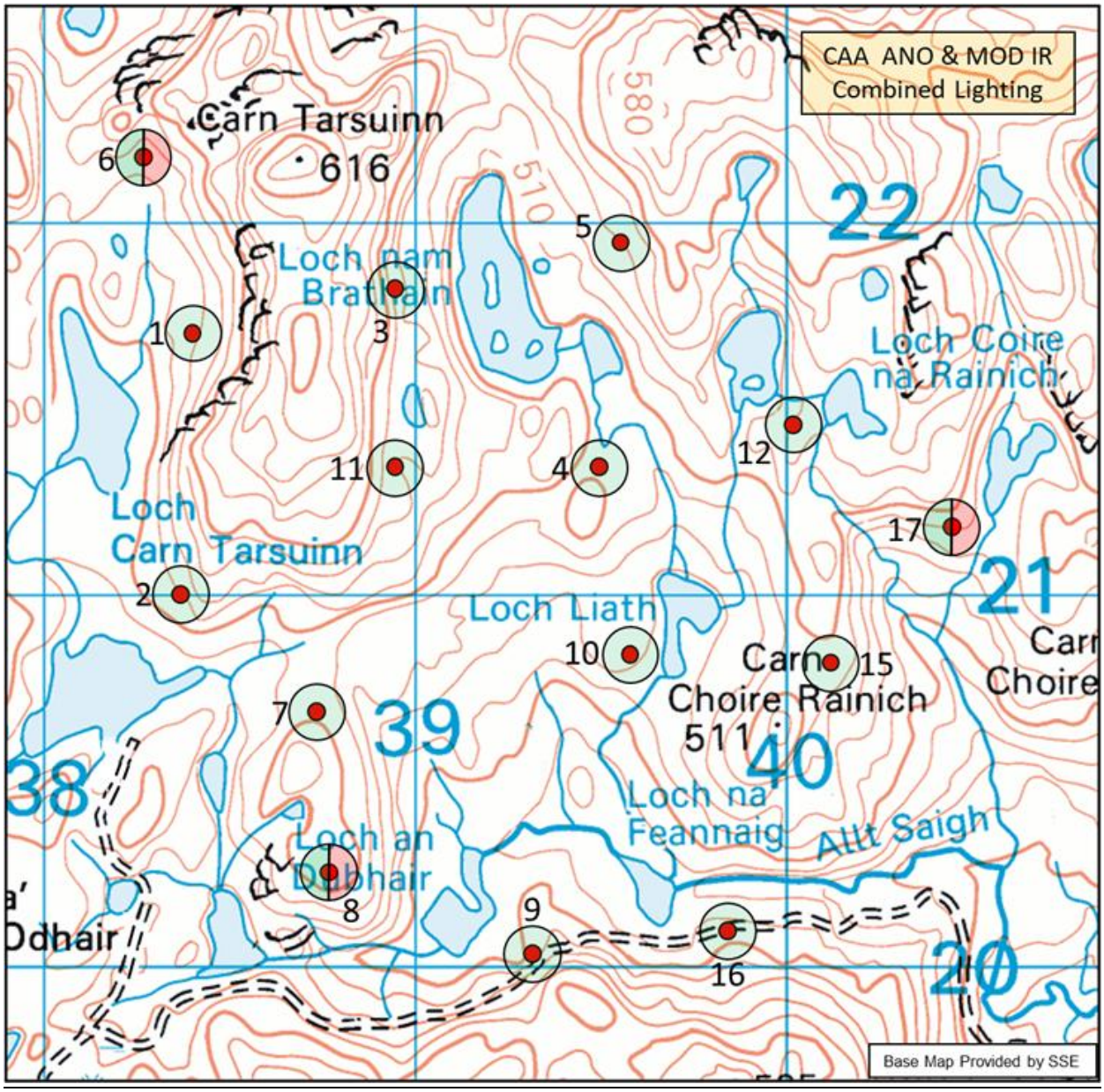



Figure 9: Combined CAA ANO & MOD IR Lighting Proposal with 3 Visible & 15 IR Lights

## ANO Light Specifications

### Medium Intensity Hub Mounted Lights

The ANO 2000/200cd Lights will conform to the ICAO specification as set-out in the ICAO Annex 14 at Table 6-3 reproduced below.

The lights will also be controlled such that when the met visibility is greater than 5km in all directions from all turbine hubs, the lights will be reduced to 200cd (10% of normal power).

The CAA currently state: *met visibility should be measured at suitable points around the wind farm*. In the case of the Bhlaraidh Extension turbines: Visibility Meters on T2, T5, T6, T9 and T17 will meet this criterion.

This reduction in power will not apply to MOD IR Lights.

ICAO Annex 14 Table 6-3 (excerpt)

| Benchmark intensity | Minimum requirements | | | | | Recommendations | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Vertical elevation angle (b) | | | Vertical beam spread (c) | | Vertical elevation angle (b) | | | Vertical beam spread (c) | |
| | 0° | | -1° | | | 0° | -1° | -10° | | |
| | Minimum average intensity (a) | Minimum intensity (a) | Minimum intensity (a) | Minimum beam spread | Intensity (a) | Maximum intensity (a) | Maximum intensity (a) | Maximum intensity (a) | Maximum beam spread | Intensity (a) |
| 2000 | 2000 | 1500 | 750 | 3° | 750 | 2500 | 1125 | 75 | N/A | N/A |

a) 360° horizontal. All intensities are expressed in Candela. For flashing lights, the intensity is read into effective intensity, as determined in accordance with the Aerodrome Design Manual (Doc 9157), Part 4.
b) Elevation vertical angles are referenced to the horizontal when the light unit is levelled.
c) Beam spread is defined as the angle between the horizontal plane and the directions for which the intensity exceeds that mentioned in the "intensity" column.

Figure 10: ICAO Annex 14 Table 6-3 Medium Intensity Obstacle Lights

### Low Intensity Mid-Mast Lights

WFLFAC will request that the CAA set-aside the guidance requirement for 32cd (Type B) mid mast lights for the Bhlaraidh Extension turbines.

**Table 6-2. Light distribution for low-intensity obstacle lights**

| | Minimum intensity (a) | Maximum intensity (a) | Vertical beam spread (f) | |
|---|---|---|---|---|
| | | | Minimum beam spread | Intensity |
| Type A | 10 cd (b) | N/A | 10° | 5 cd |
| Type B | 32 cd (b) | N/A | 10° | 16 cd |
| Type C | 40 cd (b) | 400 cd | 12° (d) | 20 cd |
| Type D | 200 cd (c) | 400 cd | N/A (e) | N/A |

*Note.— This table does not include recommended horizontal beam spreads. 6.2.1.3 requires 360° coverage around an obstacle. Therefore, the number of lights needed to meet this requirement will depend on the horizontal beam spreads of each light as well as the shape of the obstacle. Thus, with narrower beam spreads, more lights will be required.*

Figure 11: ICAO Annex 14 Table 6-2 Low Intensity Obstacle Lights.

## Mid-Mast Lighting (32cd Lights on Turbine Mast)

Mid mast lighting was originally intended to give an attitude/range reference (vertical/horizon indication) to pilots flying at night in the days before NVGs. A tip/hub light, with a mid/mast light, when fitted to a single vertical structure, will give a vertical reference (from which a horizontal reference can be gauged). In contrast, a single light on a single structure will not give a vertical or horizontal reference or indication of range, range-rate and sight-line spin values or changes to an approaching pilot. However, a series of single tip/hub lights, on a group of structures, will provide a good horizon reference together with range, range-rate and sight line spin clues to a pilot. Accordingly, the requirement for mid-mast lights is much diminished if not made redundant in the case of lit multiple vertical structures such as wind farms.

All of the current commercially available 32cd (supposedly focused) lights are over-engineered (up to 70cd between -30deg and +40deg). This is to fit a multitude of aviation and marine applications where the 32cd spec is seen as a minimum, not maximum, intensity. As a result, they induce a disproportionately large environmental impact, often significantly more than the focused hub 2000/200cd lights. WFLFAC will request that the CAA guidance requirement for 32cd (Type B) mid mast lights be removed for the Bhlaraidh Extension.

## IR Light Specifications

The IR lights, mounted on the turbine hubs, will conform to the MOD specification as set-out in MOD Lighting Guidance below.

**MOD Specification IR.**

IR wavelength – 750 to 900nm.
But ideally concentrated within 800 to 850nm for optimum detection by all military NVG types.

IR intensity – 600mW/sr minimum at peak flash but not above 1200mW/sr.
(Note: Typically a 300mW/sr steady burn LED IR light will generate 600mW/sr at peak flash)
This will generate a 7-8 nm NVG pick-up range - remaining above 5nm as the light ages.

Horizontal Pattern – unrestricted 360 deg.

Vertical Pattern – Minimum flash intensity of 600 mW/sr between +30 deg and -15 deg elevation.
– up to 50% reduction between +25 to +30 deg and -10 to -15 deg is acceptable.
– Maximum intensity of 1200 mW/sr for all angles of elevation.
– Vertical overspill is acceptable.

Flash Pattern – 60 flashes per min at 100-500 ms duration (ideally 250ms)

Synchronisation – all lights to be visually synchronised across a wind farm site

Figure 12: MOD Specification for IR Obstacle Lights.

## Timings

The lights (IR and ANO) will be switched-on between Evening Civil Twilight and Morning Civil Twilight in accordance with the UK Almanac. Approximately 11 hours per day averaged over the year. Conversely, the lights can be switched-on by a suitable Lux Meter when the sun light falling on a vertical surface, drops below 500 Lux. This also will average 11 hours per day over a calendar year.

## Intensity Reduction (ANO Lighting: 2000cd down to 200cd) Weather Factors

It is possible to take advantage of the CAA SARG Policy Statement dated 01/06/2017 and incorporate the option to reduce the hub height lighting to not less than 10% of the of the minimum peak intensity specified for the installation in good weather. In essence, reducing the 2000cd obstruction lights to 200cd in meteorological visibilities greater than 5km.

Note: As stated earlier, this concession is not applicable to MOD specification IR lighting.

Accordingly, if it is possible to assess how much time the met visibility will be below 5km, it will be possible to assess how much time the lights would spend at 200cd as opposed to 2000cd. To assess historical visibility in the Bhlaraidh Extension area, the closest meteorological station is at Inverness Airport. The visibility will not be identical at these two locations, but similar. They will invariably be in the same air-mass.

Inverness issues historical meteorological data in the Met-Office format which use block graph tables. Below is a Met-Office table of visibilities at Inverness across the year and averaged over a 30-year period.

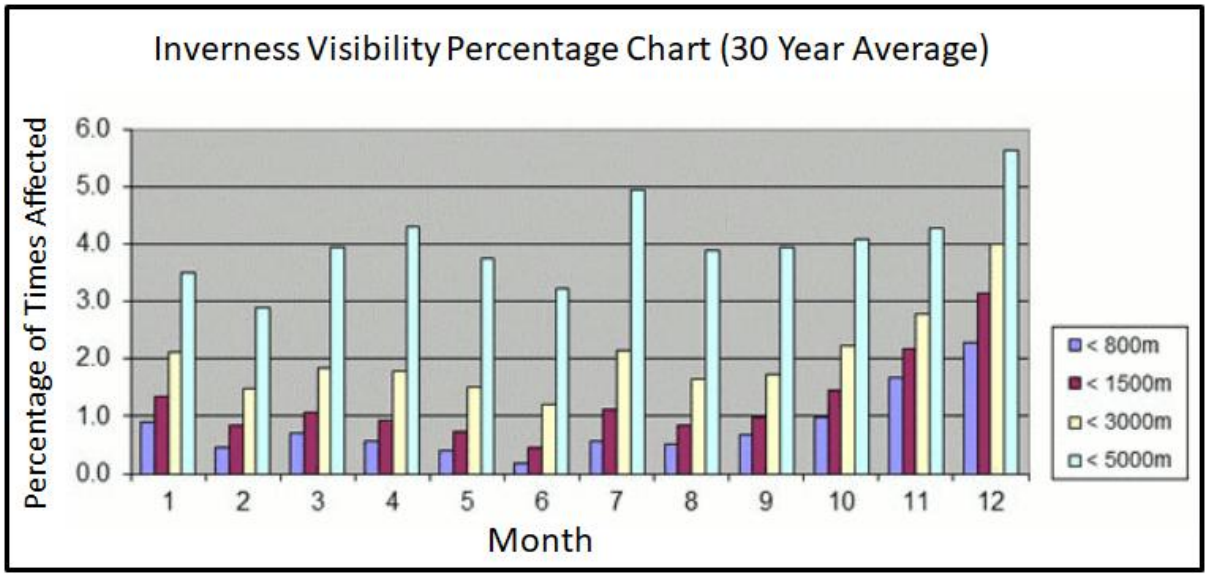



Figure 13: Visibility Table for Inverness Airport (Light Blue is 5km Indicator)

This Met Office table shows us that the visibility is below 5km for an average of 4% of the times measured.

This suggests that the lights will be at **2000cd for 4% of the time and 200cd for 96% of the time**.

In addition, met visibility improves with height since the concentration of particles (dust, haze) and liquid droplets (water) reduces with height and the air also becomes thinner. It could be argued that the Bhlaraidh Extension visibility would be better than that at Inverness. Moreover, cloud will play its part in the observability of the obstruction lights at Bhlaraidh Extension. This can also be obtained from Met Office data.

## Weather Obscuration.

On occasion, the visibility in the area of Bhlaraidh Extension will drop significantly due to the presence of cloud on the hills. If the Bhlaraidh Extension turbines are in cloud, then the obstruction lights will not be seen. In a similar vein, if the turbines are partially shrouded in cloud, then the light intensity will be much reduced.

Note: All heights and elevations in aviation are measured and presented in feet and not metres.

The turbines will carry the CAA/ANO lights on the turbine hub. The average height at the base of these turbines is around 1400-1700ft above mean sea level (amsl). The hub heights, for the proposed turbines will be around 400ft above ground level (agl) giving hub heights averaging around 1800-2100ft amsl.

Using these heights, it is possible to compare the hub mounted light altitude (amsl) with the actual cloud bases recorded by the Met Office at Inverness (over a 30-year period) as shown below in Figure 14 on the following page.

The darker red columns (600-1000ft amsl) indicate that, on around 250 occasions a month, the cloud-base will be well below the turbine base heights. In addition, the combined blue, red and yellow columns indicate that on a further 150 times a month the weather would be such that the cloud would be so low that the turbines/lights would only be visible to people on the hills when very close to the turbines.

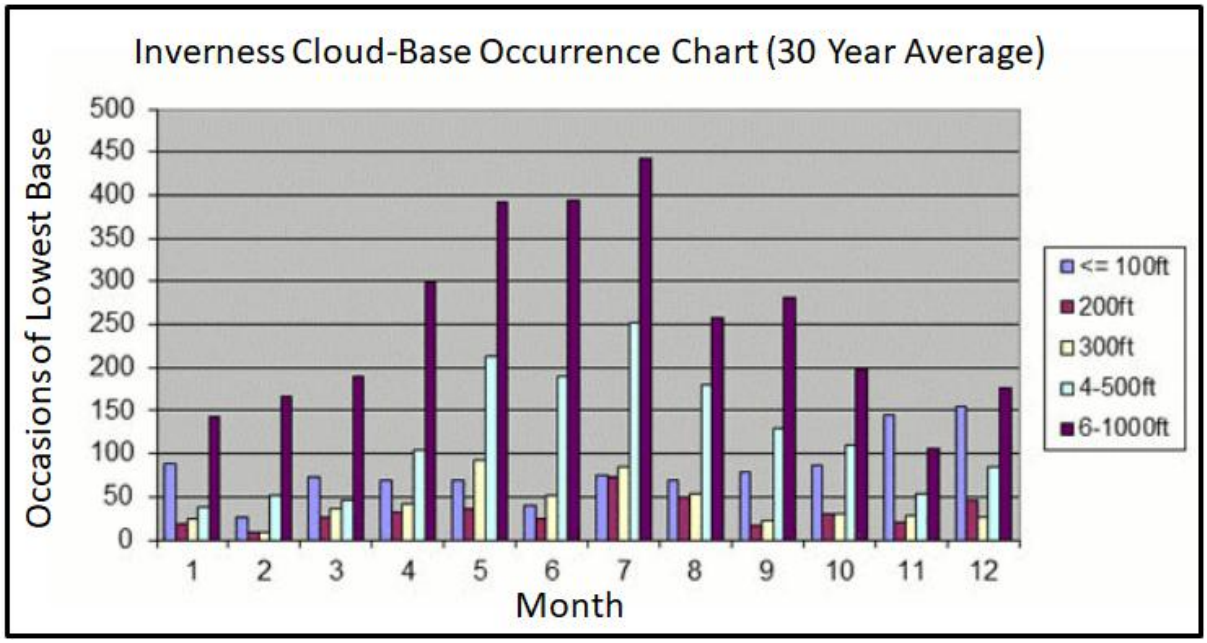



Figure 14: Average Cloud-Base Table for Inverness Airport

Furthermore, meteorological statistics and science show that a cloud-base will reduce in the region of hills. It could be argued that at Bhlaraidh Extension the cloud-base would, on the whole, be lower than at Inverness thus providing even greater degree of light obscuration on more occasions per month.

## Weather Obscuration Conclusion

It is most important not to try and combine the two different observations, visibility and cloud-base, into a single statement. Informal advice direct from Met Office and Airport forecasters indicates the information so gathered, should be presented as follows:

> *Meteorological observations suggest that the turbine hubs/lights will be obscured on around 400 occasions a month by cloud.*
>
> *When not obscured by cloud, the visibility in the area of the turbines can be expected to exceed 5km for 96% of the time and the lights will be switched down to 200cd.*

## Changes in the Lighting Environment.

CAA-ANO 2000/200cd Visible Red Lighting

Informal discussions with the CAA has indicated that the issue of variations, under (ANO) Article 222 section 6, will still be issued. However, a wider range of scenarios and options will be taken into account to ensure that flight safety remains paramount. It is expected that new CAA guidance will be issued to this effect in the near future. Although the wider regulatory requirements will be to the fore, below are a few scenarios that may be considered within the overall review:

- Whilst it is possible to consult with local airspace users to determine a suitable lighting arrangement (as suggested in ICAO Annex 14), it will also be important to consider potential lower airspace users from further afield. Such occasional users, not so familiar with the airspace, will benefit from more visible-lighting to confirm flight safety.

- Aircraft/helicopters operating without NVDs may suffer power/engine failures and struggle to maintain height and descend below safety-altitude. A turbine site with visible lighting will provide a safer flying environment for the crew as opposed to invisible IR lighting alone or relying on a map or nav display to assess separation.

- Aircraft/helicopters operating at low level, near turbine sites and using NVD/G equipment, may suffer electrical failures (generator failures etc) and be left with reduced/no NVD facilities. With IR lighting now invisible to the crew, the presence of visible lighting on the turbines will help the crew to fly a safe climb to safety altitude. Note: the author of this briefing has experienced this scenario during a dedicated turbine lighting flight trial when IR obstruction lights were first being developed and assessed.

- Even the most experienced pilot can become disorientated and lost during high workload situations. Again, this author, as an instructor pilot operating in Scotland, has seen very experienced pilots (1000+hours on jets) surrounded by a phalanx of sophisticated nav equipment, become lost and unsure of local high terrain and the relevant safety altitude. A 500ft plus wind turbine site, without visible obstruction lighting, in this scenario could only reduce the flight safety margins of the flight.

- Finally, cognisant that green-plant-based-jet-fuel is still very polluting, climate change is driving the development of battery and fuel cell powered commercial aircraft. Development of these power sources is growing apace and it is entirely possible that such aircraft will be flying in the life span of current wind turbine sites. These green powered aircraft are predicted not to fly at tens of thousands of feet but a few thousand feet only. At such altitudes, visible lighting on wind turbine sites will clearly improve overall flight safety significantly.

Where turbine sites border each other, it has become customary to not fit lighting on the turbines along the common perimeter. However, if the sites reach their end-of-life at different times, or sites are re-powered (usually by fewer larger turbines) the lack of lighting on the shared border may result in an incomplete lighting arrangement. This is a growing phenomenon as more turbine sites reach end-of-life. The CAA has recently endorsed sites where the common border turbines are fitted with lighting (visible and or IR) but not illuminated. These lights are then lit when the adjacent turbine site is dismantled, or re-powered, to restore the perimeter.

MOD Infra-Red 600mW/sr Lighting

Informal discussions with the MOD Defence Infrastructure Organisation (DIO) and a correspondence exchange with the Military Airspace Management Cell (MAMC) at Swanwick suggests that future lighting requests/requirements by the MOD will follow or remain close to the published MOD Guidance to Wind Farm Developers.

- One of the main drivers in the MOD policy for IR lighting, is consideration for helicopters, singles or formations, operating at low level at night. Whilst fast-jet and tactical transport aircraft must fly around turbine sites, helicopters, in most circumstances, are allowed to fly through turbine sites as individuals or formations. As a result, the MOD guidance requires complete perimeter lighting, and for those sites exceeding a certain footprint area, central turbine lighting also.

- In a similar vein to the CAA, the MOD recognises that a survey of local users, operating in what can be described as their back-yard, may result in the proposal of a reduced IR lighting requirement. However, military helicopters, on detachment, operating in new/temporary training airspace, will benefit from adherence to the MOD guidance of a full perimeter of IR Lights and central turbine lighting for large sites.

## Conclusion/Notes

The purpose of this Lighting Brief is to identify an obstruction lighting arrangement, for the 15 turbine Bhlaraidh Extension, that is both environmentally friendly and a safe design for night low level operators. This has been accomplished by using a combination of CAA ANO and MOD IR lights.

Applying the CAP 764 Draft criteria, for visible red obstruction lighting, results in a high-density lighting solution. By initially applying current CAA dispensations, and then matching the lighting to the operators that will require night visible lighting, an environmentally friendly, but aviation safe, layout can be achieved. This results in a total of:

***5 ANO Red 2000/200cd lights and 15 MOD IR 600mW/sr lights***

It may possible that the CAA will accept a further reduced layout as follows:

***3 ANO Red 2000/200cd lights and 15 MOD IR 600mW/sr lights***

Furthermore, the site is in an area where it will benefit from 90% light-dimming in good-weather and regular obscuration of both turbines and the visible ANO lighting in poor-weather. These dimming and obscuration benefits are potentially significant.

***The lights will be regularly obscured by cloud and when not obscured set at the lower 200cd for approximately 96% of the time.***

The formal WFLFAC lighting proposal shown in Figures 7, 8 and 9 will require CAA Wind Farm Policy and MOD DIO/LFOS approval.

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## The Author

Mike Hale has spent over 45 years flying both civilian and military aircraft around the world. During 40 years as a military pilot, he filled the posts of operational low level fast jet pilot, fighter pilot, flight commander, air combat leader, instructor pilot (fast jet and basic training), senior instructor, principal examiner, test pilot and squadron commander. For his last 8 years in the military, and in concert with his continued flying duties, Mike held the position of OC the MOD Low Flying Operations Squadron. In this post, as well as overseeing the management and safe operation of the UK Low Flying System and Weapons Ranges, he wrote, and had approved, the MOD guidance to wind energy developers for the integration of wind turbines, masts and infrastructure into low flying systems. Moreover, between 2008 and 2012, Mike proposed, set-up and ran a series of MOD, CAA, Trinity House, vertical obstacle lighting flight trials to clear the use of infra-red and low intensity red lights for use in low flying areas. This was followed by compiling the detailed specifications for such lights, relaying the results to other military authorities and assisting aviation lighting companies, in several countries, to start production of these lights.