



PLANNING DEPT.	
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Mrs Claire Alder  
Mole Valley District Council  
Pippbrook  
Dorking  
Surrey  
RH4 1SJ

9<sup>th</sup> March 2009

Your Ref: MO/2009/0041/PLA  
Our Ref: N/SFG/W(F)8428

Dear Madam,

**Wind Farm: Tesco, Hookwood**

The proposed development has been examined by our technical and operational safeguarding teams and although the proposed development is likely to impact our electronic infrastructure NATS (En Route) Plc ("NERL") has no safeguarding objection to the proposal.

Details of the NERL assessment are outlined in the attached report TOPA W(F)8428.

Please email [NATSSafeguarding@nats.co.uk](mailto:NATSSafeguarding@nats.co.uk) with the results of the planning application process for this development. NERL assessments take into account both existing and previously assessed wind farm developments and knowing the results of the planning application process significantly assists NERL with the assessment of other developments.

If you have any queries regarding this matter you can contact us on the telephone number given at the top of this letter.

Yours faithfully



Sarah Allen  
Technical Administrator  
On behalf of NERL Safeguarding Office



SCANNED

## Engineering and Programmes

### Technical and Operational Assessment of Proposed Development at Tesco, Hookwood

Our Reference - N/SFG/W(F) 8428

Your Reference - MO/2009/0041/PLA

TOPA/W(F)8428 ◊ Issue 1

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## Publication history

Issue	Month/Year	Change Requests in this issue
Issue 1	March 09	

## Referenced documents

List of documents referenced in this publication, for example:

- |   |             |
|---|-------------|
| (1) End-to-End Assessment Methodology             | - S1/-WI/03 |
| (2) Surveillance Technical Assessment Methodology | - S1/-WI/01 |
| (3) Operational Assessment Methodology            | - S1/-WI/02 |

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## 1 Background

1.0.1 NATS En Route Plc ("NERL") is responsible for the safe and expeditious movement in the en-route phase of flight for aircraft operating in controlled airspace in the UK. To undertake this responsibility NERL has a comprehensive infrastructure of radars, communication systems and navigational aids throughout the UK, all of which could be compromised by the establishment of a windfarm. In this respect NERL is responsible for safeguarding this infrastructure to ensure its integrity to provide the required services to Air Traffic Control (ATC). In order to discharge this responsibility NERL assess the potential impact of every proposed windfarm development in the UK, this document defines the assessment of the potential impact of the proposal as detailed in section 2.

## 2 Wind-farm Details

2.0.1 NERL have been requested by Mole Valley District Council to assess the potential impact of a 2 'helical' type turbines at Tesco Stores, Reigate Road, Hookwood, Surrey, RH6 0AT.

### Turbine Locations

Designator	Easting	Northing	Hub Height	Tip Height
1	527026	142664	10.6	12.25
2	527123	142636	10.6	12.25

### Turbine Characteristics

Feature	Detail
Turbine Manufacturer and Model	-
Rotor Diameter (m)	3.3
Rotation Rate (rpm)	-
Tower base diameter/ dimensions (m)	-
Tower top diameter/ dimensions (m)	-

## 3 Assessment of Effect on NERL Navigational Aids

3.0.1 No impact on NERL Navigational Aids

## 4 Assessment of Effect on NERL Air-Ground Voice Communication Systems

4.0.1 No impact on NERL Air-Ground Voice Communication Systems

## 5 Assessment of Effect on NERL RADAR

### 5.1 Sites Potentially Effected

5.1.1 The proposed development falls within the operational range of the following NERL Radar systems;

#### Potentially Effected Radar

Radar	Easting	Northing	Range (nm)	Bearing (True)
Burrington Radar (cmb)	260590	116860	144.5	82.9°
Claxby Radar	512440	396150	137.1	178.1°
Clee Hill Radar	359440	277980	116.3	128.5°
Debden Radar	555540	234840	52.1	199.0°
Gatwick FFM	525680	152370	5.3	173.5°
Gatwick Radar	526710	140000	1.5	8.2°
Heathrow Radar (10cm)	508200	175970	20.7	151.7°
Heathrow Radar (23cm)	507500	176030	20.9	150.9°
Heathrow Radar (RSS 10cm)	508410	174700	20.0	151.1°
Pease Pottage FFM	538680	155180	9.2	224.5°
Pease Pottage Radar	525170	133080	5.3	12.4°
Stansted Radar	553090	222710	45.5	199.8°
TSF Radar (Spec. Hse)	528590	139700	1.8	333.7°
TSF FFM	525680	152370	5.3	173.6°

### 5.2 Predicted Effect on Burrington (cmb)

5.2.1 The effect on Burrington has been assessed as negligible.

### 5.3 Predicted Effect on Claxby

5.3.1 The effect on Claxby has been assessed as negligible.

### 5.4 Predicted Effect on Clee Hill

5.4.1 The effect on Clee Hill has been assessed as negligible.

### 5.5 Predicted Effect on Debden

5.5.1 The effect on Debden has been assessed as negligible.

## **5.6 Predicted Effect on Gatwick FFM**

5.6.1 The effect on Gatwick FFM has been assessed as negligible.

## **5.7 Predicted Effect on Gatwick**

5.7.1 Using the theory as described in Appendix A and the specific propagation profiles to the turbines it has been determined that at a range of only 1.5nm and with no terrain screening available to attenuate the signal, turbines of this size are likely to cause false primary plots to be generated.

5.7.2 A reduction of the primary radar's ability to detect small aircraft at low altitude in the airspace residing directly above the windfarm is also anticipated.

5.7.3 The effect on the co-mounted Gatwick SSR has been assessed as negligible.

## **5.8 Predicted Effect on Heathrow (10cm)**

5.8.1 The effect on Heathrow (10cm) has been assessed as negligible.

## **5.9 Predicted Effect on Heathrow (23cm)**

5.9.1 The effect on Heathrow (23cm) has been assessed as negligible.

## **5.10 Predicted Effect on Heathrow RSS (10cm)**

5.10.1 The effect on Heathrow RSS (10cm) has been assessed as negligible.

## **5.11 Predicted Effect on Pease Pottage FFM**

5.11.1 The effect on Pease Pottage FFM has been assessed as negligible.

## **5.12 Predicted Effect on Pease Pottage**

5.12.1 The effect on Pease Pottage has been assessed as negligible.

## **5.13 Predicted Effect on Stansted**

5.13.1 The effect on Stansted has been assessed as negligible.

## **5.14 Predicted Effect on TSF (Spec House)**

5.14.1 The effect on TSF (Spec House) has been assessed as negligible.

## **5.15 Predicted Effect on TSF FFM**

5.15.1 The effect on TSF FFM has been assessed as negligible.

## **5.16 Summary of Potential Effect**

5.16.1 The radar safeguarding assessment reveals that the windfarm development is located within an area where there is no terrain shielding from the Primary Radar Service at Gatwick. Due to the large dimension of the wind turbines and the distance from the radar it is anticipated that the reflected power from the wind turbines will be of adequate value to be detected by the radar and consequently generate false plots. A reduction in the radar's probability of detection, for real targets, is also expected.

## 6 OPS Review Process

### 6.1 Required Reviewers of TOPA and their response

#### TOPA Responses

Unit or Role	Comment
RDP Asset Management	No Objection
LACC	No Objection
LTCC	No Objection

### 6.2 Output of Windfarm Assessment Group

6.2.1. It has been assessed that this application does not impact on NERL at the present time and is therefore the WAG recommends not raising an objection to the proposed development.

## 7 Conclusions

7.0.1 The proposed development has been examined by NERL's technical and operational safeguarding teams and although the proposed development is likely to impact our electronic infrastructure NERL has no safeguarding objection to the proposal.

## 8 Appendix A – Radar Background Theory

### 8.1 PSR False Plots

When radar transmits a pulse of energy with a power of  $P_t$  the power density,  $P$ , at a range of  $r$  is given by the equation;

$$P = G_t.P_t/(4\pi.r^2)$$

Where  $G_t$  is the gain of the radar's antenna in the direction in question.

If an object at this point in space has a radar cross section of  $\sigma$ , this can be treated as if the object re-radiates the pulse with a gain of  $\sigma$  and therefore the power density of the reflected signal at the radar is given by the equation;

$$P_a = \sigma.P/(4\pi.r^2) = \sigma.G_t.P_t/((4\pi)^2.r^4)$$

The radar's ability to collect this power and feed it to its receiver is a function of its antenna's effective area,  $A_e$ , and is given by the equation;

$$P_r = P_a.A_e = P_a.Gr.\lambda^2/(4\pi) = \sigma.G_t.Gr.\lambda^2.P_t/((4\pi)^3.r^4)$$

Where  $G_t$  is the Radar antenna's receive gain in the direction of the object and  $\lambda$  is the radar's wavelength.

In a real world environment this equation must be augmented to include losses due to a variety of factors both internal to the radar system as well as external losses due to terrain and atmospheric absorption. For simplicity these losses are generally combined in a single variable  $L$ .

$$P_r = \sigma.G_t.Gr.\lambda^2.P_t/((4\pi)^3.r^4.L)$$

### 8.2 SSR Reflections

When modelling the impact on SSR the probability that an indirect signal reflected from a wind turbine has the signal strength to be confused for a real interrogation or reply can determined from a similar equation;

$$P_r = \sigma.G_t.Gr.\lambda^2.P_t/((4\pi)^3.rt^2.rr^2.L)$$

Where  $rt$  and  $rr$  are the range from radar-to-turbine and turbine-to-aircraft respectively. This equation can be rearranged to give the radius from the turbine within which an aircraft must be for reflections to become a problem.

$$rr = (\lambda^2/(4\pi)^3)^{1/2} \cdot (\sigma.G_t.Gr.P_t/(rt^2.P_r.L))^{1/2}$$

### 8.3 Shadowing

When turbines lie directly between a radar and an aircraft not only do they have the potential to absorb, or deflect, enough power such that the signal is of insufficient level to be detected on arrival it is also possible that azimuth determination, whether this done via sliding window or monopulse, can be distorted giving rise to inaccurate position reporting.

### 8.4 Terrain and Propagation Modelling

All terrain and propagation modelling is carried out by a software tool called ICS Telecom (version 6.99). All calculations of propagation losses are carried out with ICS Telecom configured to use the ITU-R 526 propagation model.

## 9 Appendix B – Diagrams

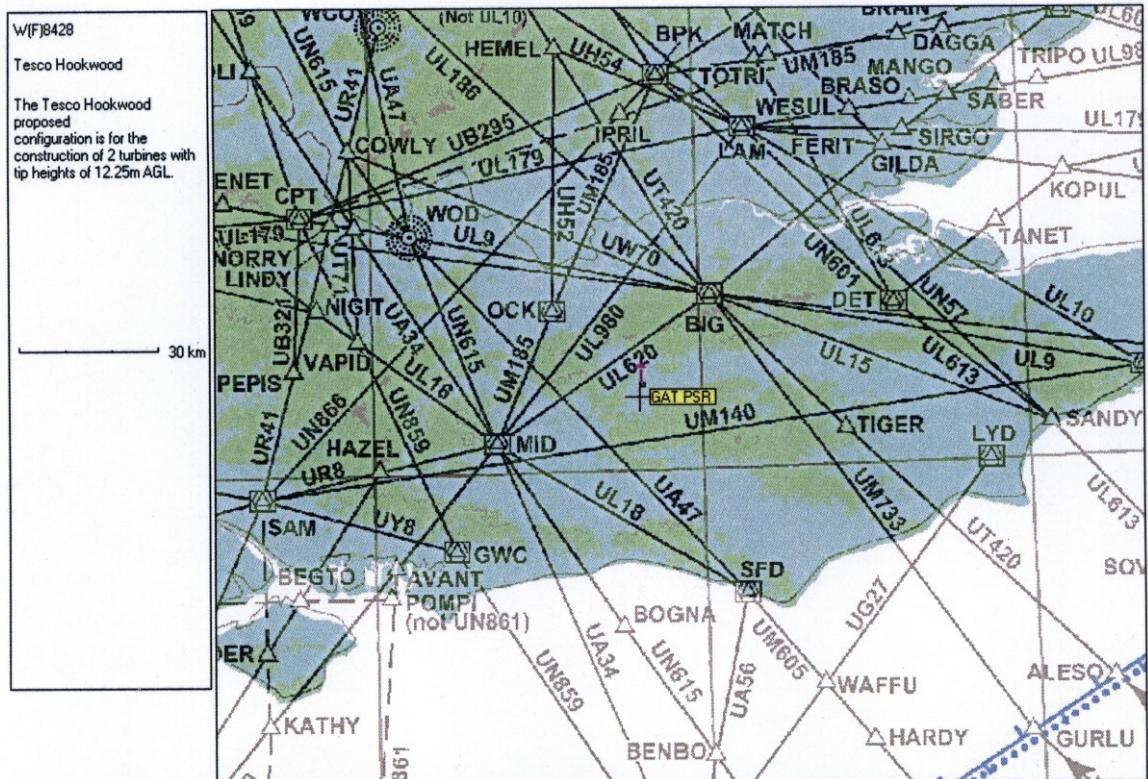


Figure 1: Tesco, Hookwood proposed location shown on an airways chart