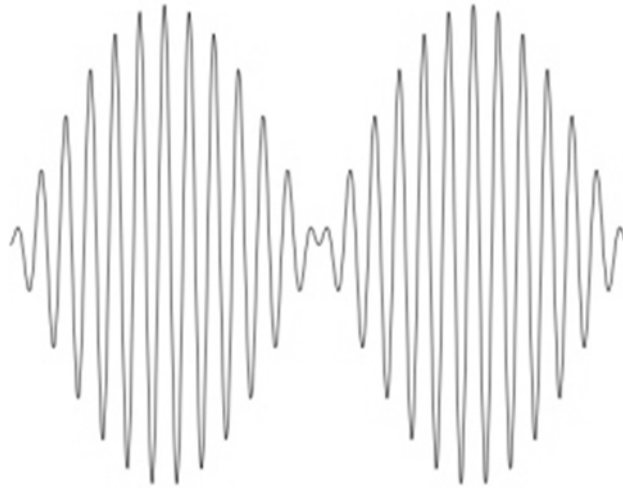


Wind Turbine Noise & Amplitude Modulation

A Study of Noise & AM Complaints Received by Local Planning Authorities in England



07 November 2014

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View of a turbine at Cotton Farm Wind Farm, Graveley, St Neots, Cambridgeshire

Foreword & Objectives

"There are big gaps between the way in which opposing stakeholders see the issue and scale of noise from industrial wind turbines, in particular the phenomenon of Amplitude Modulation (AM).

On one side Department of Energy and Climate Change (DECC) and the wind industry believe they can proceed with planning applications and development of industrial wind farms guided solely by ETSU-R-97 and its companion Good Practice Guide. They claim the incidences of complaints about noise and AM are rare and that planning conditions and statutory nuisance are the best remedy.

On the other side wind farm neighbours and concerned people, both in my constituency and those of fellow MPs, tell us this is not the case on the ground. They cite numerous examples of householders suffering from sleep deprivation and associated health issues as a result of wind turbines, and of feeling disempowered to take action or complain. They also say ETSU-R-97 is outdated, provides inadequate protection to individual householders and is in serious need of overhaul or replacement. They claim the issues and incidence of AM are not understood by Local Planning Authorities (LPAs), Local Environmental Health Protection Officers (EHOs) and the Planning Inspectorate. They are also concerned that Statutory Nuisance is not an effective tool to combat this problem.

There is a third factor that seriously concerns me. This is the lack of professional agreement on the underlying science of AM, its cause and how it should be managed at all stages in the planning process. Planning or legal precedents can be created by argument between professional representatives of both sides with a limited understanding of the science before a planning inspector or judge with even less understanding of it.

My early August letter to LPA Chief Executives had a number of objectives. First, to ensure they were aware of the concerns of our constituents and the range of problems being caused by wind turbine noise in general. Second, to bring to their attention the disputed issue of AM and to provide them with sources of information for their EHOs. Third, to quantify the incidence of actual noise and AM complaints to allow comparison to counter claims by opposing stakeholders".

Chris Heaton-Harris MP (Daventry, Conservative)
House of Commons, London SW1A 0AA, November 2014

The Author:

Trevor Sherman. An international management consultant currently specialising in senior executive coaching and leadership development training. He has extensive experience of data gathering, analysis, assessment and reporting. He addressed the LPA planning committee in opposition to the Winwick Warren Wind Farm and subsequently gave evidence on Community Consultation to the Planning Enquiry.

The Reviewers:

Dr John Yelland. MA DPhil (Oxon) MinstP FIET MIOA: A professional physicist and engineer with experience in acoustics spanning over 40 years.

Prof David Unwin. Emeritus Professor in Geography at Birkbeck, University of London. He has professional expertise in the statistical analysis of environmental data.

Richard Cowen. Solicitor specialising in planning then criminal law. Has been actively involved with NAWAG on legal issues including noise and the Den Brook judgment.

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Key Findings

This Study provides an insight into the current views of Local Planning Authority (LPA) professionals on how to prevent, control and mitigate industrial wind turbine noise including the phenomenon of amplitude modulation (AM) that gives rise to most complaints. The questions were:

- Have you received noise complaints;
- Have you received AM complaints; and
- If yes, how do you deal with them?

In this Study responses from LPA professionals to these questions are quantified and mapped, mitigations are analysed, and assessments are made about how LPAs deal with AM at all stages in the planning and enforcement processes. Gaps and omissions are highlighted.

- **Way-Forward.** There is a high level of awareness amongst LPAs of the issues and debate on AM. LPA executives are keeping themselves informed through public sources. They recognise that AM in industrial wind turbines is as yet an unresolved issue but appear to act in ignorance of the judgement of the Court of Appeal in the Den Brook case. Some LPAs show strong confidence in ETSU-R-97 and its companion Good Practice Guide. Others challenge its validity and are seeking a more robust way to deal with AM at all stages in the application and development process. They are calling for objective science based guidance on measuring and testing, nationally set agreed standards which are consistently applied and proven mitigations for AM. There are many frustrations with the current arrangements.
- **Size & Scope.** In England, of the 203 responses to question 1, 54 LPAs have received complaints about noise from industrial wind turbines. This should not be interpreted as 27% of wind farms giving rise to noise complaints; many of the LPAs which reported no complaints may well have no operating wind farms in close proximity to housing. Of the 54 LPAs, 17 have also investigated complaints about Amplitude Modulation (AM). Over 600 individual complaints had been received with the majority being in the five year period 2010-14. The main clusters of complaints are in the East of England, East Midlands, West Midlands, North West and South West. There are less in the South East, one in Yorkshire and the Humber and one in the North East.
- **Inconsistent & Inconclusive.** Not only are incidents of AM more frequent than the wind industry hitherto has claimed, the progress with resolving them is inconclusive. There are inconsistent approaches to dealing with AM across the country. Some LPAs have agreed curtailment of operation with the wind turbine operators while investigations continue, others have only proceeded with investigations. None of the LPAs described a working mitigation for AM other than curtailment. Some LPAs have taken a proactive approach on AM by investing time and effort with developers at the pre-application stage.

- **Broader Issues.** A significant part of the public debate on industrial wind turbine noise generally, and on AM specifically, is about protecting the health and well-being of the public who are wind farm neighbours, but there were no mentions of this factor by LPA respondents. There is an indication that wind farm neighbours who are well organised in local groups and with professional support can make better progress with their complaints than others. On the other hand, scatter gun complaining may not be effective. There is also a hint of a 'silent majority' who suffer in silence in the absence of knowing how to complain, or because of a fear of adverse implications, for example, they would have to disclose any complaint if they wish to sell their house. For communities a barrier to complaining might be the fear of adversely affecting community funding from wind turbine operators. This leads to the conclusion that a 'community charter' would be valuable for all sides.

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Author: Trevor Sherman

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Section 1 - Introduction

In his foreword to this Study, Chris Heaton-Harris MP explains why he wrote to the Chief Executives of 265 Local Planning Authorities in England advising them of the public's concerns about wind turbines noise, bringing to their attention the debate on AM and asking them to report the incidence of noise and AM complaints in their Authority. The full text of his letter is in Appendix A. Let's look at the three main steps that led up to Chris Heaton-Harris writing this letter.

1. A Meeting with the Secretary of State at DECC in London

In early 2013 Chris Heaton-Harris offered to sponsor a meeting between a group of his constituents and The Right Honourable Ed Davey, Secretary of State at the Department of Energy & Climate Change (DECC). The constituents wanted to make their representations about the adverse impact of noise from industrial wind turbines and the way noise was being dealt with in the planning application process.

Originally planned for March 2013, the meeting took place in October 2013. In addition to the Secretary of State, present at the meeting were representatives of his department, of DEFRA and of the Institute of Acoustics. Chris Heaton-Harris's party comprised constituents Richard Cox, Dave Unwin and Trevor Sherman along with Mike Stigwood of MAS Environmental Cambridge who is a professional acoustician.

Dave Unwin and Richard Cox presented what they called '*The Bad Science*' behind the Wind Turbine Noise Guidelines following the release of the *Good Practice Guide* to ETSU-R-97.

They summarised as follows. "*In our view the Good Practice Guide fails to demonstrate that it is based on sound science*". They concluded that in their view "*In the current absence of effective noise guidelines we believe that only by enforcing a minimum separation distance, (typically in the order of 2km for the current generation of industrial wind turbines) can a reasonable degree of protection be provided against noise nuisance*".

They went on to comment on Amplitude Modulation (AM) suggesting that the science behind AM was being hidden stating: "*Amplitude Modulation or AM is the most intrusive noise characteristic of turbine noise so we fail to see how excluding it from the Good Practice Guide terms of reference can be justified. As a result the science behind AM stays hidden and the wind industry pretends it is not an issue*".

This theme was then taken up by Mike Stigwood of MAS Environmental who told the Secretary of State: "*There are serious noise issues in the UK caused by wind turbines. The problem is growing; as decision makers downplay the complaints of people affected, whilst the body of scientific evidence is increasing*". Stigwood gave an update on a study he was in the process of completing on noise complaints from over 70 UK wind farms, with his final report being due for release in early 2014. He gave the Secretary of State a summary of his study under the heading '*Evidence of Failure of Wind Farm Guidance to Protect Well-Being*':

- All but one of the wind farms causing noise complaints he had investigated are considered to comply with ETSU-R-97;
- More than 75 wind farms are causing noise complaints leading to evidence of harm to well-being such as sleep disturbance;
- Potentially 80-160 wind farms are causing problems with 1,000s of homes affected;
- His research shows Excess Amplitude Modulation (EAM) is the main problem and is caused by all large wind turbines.

He summarised as follows. *“ETSU-R-97 is incapable of controlling and/or preventing adverse effects or being modified to achieve that purpose. The well-being of a significant minority of communities is being jeopardised”*. He concluded that in his view: *“EAM is common and not rare as suggested by UK Government policy. Reliance by UK Government on experts of known persuasion (who are reliant on industry and derive major income with pointless compliance tests that do not fail) is the reason for the problem. The same problem arises with the Institute of Acoustics who are dominated by acousticians reliant on industry and who selected a working group dominated by individuals of known persuasion.”* Stigwood claimed that, regardless of methodology, operational wind farms shown to be compliant with ETSU-R-97 are causing complaints and that all wind farms causing serious problems comply with ETSU-R-97 guidance. He described AM as the cyclic rise and fall in noise levels described as a 'thumping', 'whooshing', 'beating' and said *“The main problem with AM is the character of the noise, not the decibel level”*. To prove his point, throughout his presentation he played a recording of AM from Cotton Farm Wind Farm in Cambridgeshire http://www.masenv.co.uk/~remote_data/

2. A Presentation to the Institute of Acoustics Workshop in Newport South Wales

Richard Cox was invited to give a paper at the Institute of Acoustics Workshop in Newport South Wales in March 2014. He chose as his theme: *‘A Critique of the renewableUK report on wind turbine amplitude modulation: What it tells us and what it does not’*. In his paper Cox provided a critical examination of the study reUK had released in December 2013 about wind turbines Amplitude Modulation. In the study reUK acknowledged that AM is a problem *“too large to ignore”*. They also claim that AM is *“now largely understood”*, but also claim that *“occurrence of excess AM is rare and infrequent and where it does occur, a mitigation scheme can be implemented”*. Cox refuted the latter saying: *“the claims made by reUK are not supported by the evidence provided within the report or elsewhere”*. He claimed the reUK study was based on the 2007 Salford report which found 4 cases of EAM from 133 sites surveyed, and reUK extrapolated these data to suggest at the time of their report only 15 sites out of 521 or 3% would be affected by EAM.

Richard Cox was critical of reUK’s methodology: *“It seems quite incredible that during the 3 years of the research project into AM, reUK did not bother to survey the incidence of EAM and quantify the noise nuisance. As a result they have no evidence to support their claim that EAM is limited and infrequent or otherwise. Meanwhile, Mike Stigwood of MAS has identified EAM at over 70 sites”*. He went on to cite other 2013 AM studies from outside the UK where high incidence of EAM had occurred. And whilst the reUK study summary claims

that AM is caused by stalled flow due to wind shear and turbulence it failed to provide any actual evidence linking blade stall with EAM and buried within the report is a direct admission by the authors that there are other causes including propagation effects. Cox summarised in his paper: *“We are therefore provided with conclusive evidence that EAM is a physical consequence of the propagation of rotating turbine blade trailing edge noise. Stall is not the cause of EAM and I believe the only mitigation available is to shut down turbines”*. The reUK study appears to agree with Cox on the matter of mitigation: *“There is, therefore, currently no clear case history of successful mitigation of OAM noise, except through curtailment of turbine operation”*. Just a thought: if stall were the cause of EAM then mitigation would be possible by adjusting the blade pitch to avoid stall, which would reduce power a little, but not to zero as curtailment would. If reUK really believed in stall they would surely propose blade pitch adjustment?

Finally Richard Cox was critical of the AM Planning Condition proposed by the reUK study. *“The basis of reUK’s proposed AM condition runs counter to the evidence relating to the effects of EAM. Importantly EAM nuisance is a character issue, not a loudness issue. Therefore the AM condition should operate completely independent from the noise assessment and its associated noise loudness condition”*. In making this point Cox was echoing the statement Mike Stigwood had made to The Secretary of State in October 2013: *“The main problem with AM is the character of the noise, not the decibel level”*.

3. Six Months Silence

Despite these criticisms and new evidence DECC and reUK’s approach to AM, the first six months of 2014 have seen no response from either party. In April 2014 Dave Unwin, Richard Cox and Trevor Sherman convened a meeting with their MP, Chris Heaton-Harris, to agree a way forward. It was agreed that Local Planning Authorities should be made aware of the debate on AM control and to invite them to quantify the incidence of wind turbine noise and AM complaints in their areas. The letter from Chris Heaton-Harris to Local Planning Authorities and this summary Report are the main outcomes of this meeting.

Section 2 - Methodology

With the help of his Parliamentary Assistant David Hoy, Chris Heaton-Harris MP compiled a long list of 423 English local authorities sourced from *OpenlyLocal* <http://openlylocal.com/>. By cross reference to Department for Communities and Local Government (DCLG) sources and eliminating most Metropolitan Boroughs, all London Boroughs and most County Councils for whom the issue is not relevant, this was reduced to a short list of 265 Local Planning Authorities. This list, designated 'Non-Metropolitan Planning Authorities (England)', included the full name and postal address of the LPA. Where available from the Municipal Yearbook, the name of each Chief Executive was added.

The letter reproduced at Appendix A was sent out by post to the named Chief Executive at the 265 LPAs on or around 9th August 2014.

Complete replies and holding acknowledgements were received by letter and email and controlled by David Hoy.

A cut-off date of Friday 19th September 2014 was agreed. At this point all the emails and letters received by David Hoy were handed over to Trevor Sherman for logging and analysis. David Hoy also provided the original database he had used for the mailing in the form of an MS Excel file.

Trevor Sherman reviewed all the replies for anomalies, duplicates and any requiring a response. The latter were referred back to Chris Heaton-Harris.

All replies were scanned in batches to PDF with optical character reading (OCR) to enable copy & paste of contents and search.

The existing Excel database fields were extended to include:

- Log (number 1-265)
- Reply Date
- Batch
- MP (added from TheyWorkForYou <http://www.theyworkforyou.com/>)
- MP Party (added from TheyWorkForYou <http://www.theyworkforyou.com/>)

Plus additional fields to assist the administration and analysis.

Section 3 – In Numbers

Profile of the mailing list:			
District	200		
County	1		
National Park	10		
Unitary	53		
Metropolitan Borough	1		
Responses:		Industrial Scale Wind Turbines in LPA?	
Useable replies	205	Yes	43
Acknowledged, no reply	3	No	89
No reply	57	Unstated	72
Responder title:		All Noise Complaints?	
Chief Executive	64	Yes	54
EHO	51	No	148
Director	6	AM Only Complaints?	
Other	78	Yes	17
		No	180

The overall number of complaints received by LPAs cannot be accurately established since this was not a question asked directly in Chris Heaton-Harris's letter.

In the 54 instances where the number of noise complaints received was stated by the LPA, the total number is 589 (average 11 per LPA). There were 16 instances where the LPA indicated multiple complaints had been received, but they did not quantify this. If we take each one of these 16 to be just two complaints we can safely say at least 600 noise complaints have been processed. Taking a modest view, there are 47% of LPAs with Industrial Wind Turbines that are reporting incidents of noise complaints.

Whilst the letter from Chris Heaton-Harris did not request number of complaints, twenty seven of the 47 incidents of noise were quantified as being six or fewer complaints. One LPA (Waveney and Suffolk Coastal District Councils combined) indicated they had received 465 complaints. This somewhat skews the overall results. Extracting Waveney from the sample gives us an average of three complaints over the remaining 46 LPAs. The next highest number of complaints reported are 23 (Plymouth); 12 (King's Lynn and West Norfolk & Cornwall). Eighty percent of the complaints occurred in the 5 year period 2010-14.

Here are the 16 LPAs reporting that an unquantified number of noise complaints have been received:

Bolsover District Council	South Hams District Council	Barrow-in-Furness Borough Council
North East Derbyshire	Swale Borough Council	Torridge District Council
Braintree District Council	North Devon District Council	Allerdale Borough Council
Teignbridge District Council	Northumberland County Council	Stroud District Council
West Lancashire District Council	South Cambridgeshire	
Lewes District Council	Tendring District Council	

Section 5 – Mitigating Actions

The final paragraph in Chris Heaton-Harris’s letter to Local planning Authorities reads:

“The purpose of this letter is to ask whether you have had:

1. Any complaints about noise from wind turbines?

2. If you have had reports of amplitude modulation?

Finally, I'd like to know, if the answer to either of those two questions is positive, whether you found excessive noise or AM upon investigation and what actions you might have taken to mitigate the problem detected”.

The LPA responses on mitigation can be grouped into six categories. The thirty examples given represent more than 60% of the total of 47 LPAs saying they had dealt with noise complaints. A representative sample of the verbatim comments from LPAs are shown below and on the following pages, grouped around seven possible responses:

Abatement: an Abatement Notice was considered or served (4 examples)

Defect: a mechanical defect or other fault was found in the turbine(s) and was rectified (7 examples)

Curtailement: a curtailment of operation of operation or noise reduction management system (NRMS) was agreed and put into action (3 examples)

Closure: removal of turbine(s) was agreed and actioned (3 examples)

Pending: the case being referred to is still under investigation or being monitored (8 examples)

Actions: proactive work by the LPA EHO with the developer at the pre-application stage (4 examples)

Guidelines: this consists of the development and adoption of supplementary guidelines or planning policies (3 examples)

“In the case of 4 of the complaints, there was no evidence of a statutory nuisance. In the final case, involving an individual turbine, an Environmental Protection Act 1990 Abatement Notice was served to resolve the matter.

David Allenby, Head of Planning, Harrogate Borough Council

“We considered serving abatement notice on 2 x 20m turbines in grounds of school. The noise of the turbines was subjectively likened by officers and complainants to that of helicopter blades or a steam train running at speed. Turbines dismantled before enforcement taken. Proven Energy identified fault with turbine blades”.

Graham Hooper, Senior Environmental Protection Officer, Plymouth City Council

“We were able to show that the noise amounted to a nuisance and an Abatement Notice was served. This turbine was subsequently removed.”

Simon Hill, Environmental Protection Team Leader, South Oxfordshire District Council

ABATEMENT

"The Council received complaints in relation to turbines at 5 different locations. Complaints at two locations were resolved following maintenance of the turbines".
James Buckingham, Corporate Manager, Mid Suffolk District Council

"One complaint in relation to a medium sized wind turbine in 2012 which related to a technical fault causing a tonal sound at a certain wind speed. Remedy from manufacturer"
Andy O'Brien, Chief Executive, East Staffordshire Borough Council

DEFECT

"We have only received one complaint about two wind turbines which were producing a tonal noise. However this was resolved when we requested the operator to service the turbines, after which the noise disappeared".
Kevin Finan, Chief Executive, Mid Devon District Council

"One investigation has found excessive noise or AM. Using curtailment of operation to shut down the turbines at certain wind speeds and directions pending investigation by independent noise consultant."
G Wilson, Head of Housing and Health, Allerdale Borough Council

"Officers from HDC formally invoked planning condition 24 at Cotton Farm following the receipt of AM type noise complaints. Since identifying the noise limit breaches the operators have implemented a 'curtailed' operational mode as opposed to full operation. I can confirm that officers have heard occurrences of AM noise, however our investigation is on-going and we have yet to determine whether a statutory noise nuisance exists, or is likely to occur or recur."
Greg Kearney, Environmental Health Officer, South Cambridgeshire District Council

CURTAILMENT

"The Council have received complaints about noise from wind turbines and in the main these complaints related to amplitude modulation. A Noise Reduction Management System (NRMS) was developed which controls whether or not the turbines operate in certain wind speeds and directions."
Phil Huck, Executive Director, Barrow-in-Furness Borough Council

CLOSURE

"Complaints were received from many local residents surrounding a mid-sized wind turbine newly installed in the grounds of a local school. AM may have formed a component of the nuisance noise. Used an Abatement Notice. No remedies proved successful so the turbine was removed".
Barry Wyatt, Strategic Head (Development Services) Stroud District Council

"Another 2014 complaint does have an amplitude modulation element to it. This investigation is currently ongoing, with discussions taking place with all parties concerned with an aim to provide a mutually acceptable solution."

Alan Batty, Business Manager-
Environmental Health,
Newark and Sherwood District
Council

"The Case Officer has a working knowledge of the occurrence and causes of AM. He has requested the wind farm operator technical team investigate if over-pitching had occurred during the times stated by the resident when what was understood to be AM events occurred."

Geoff Paul, Director - Planning, Economy & Housing,
Northumberland County Council

PENDING

"We have received complaints regarding wind turbine noise from the 21 wind turbine wind farm located at Fullabrook. These complaints have included allegations of amplitude modulation, which have in some instances been witnessed by our investigating Officer. An extensive sound level monitoring exercise has recently been carried out by an acoustic consultant on behalf of the wind farm operator. The purpose was to determine the extent of the tonal noise problems which continue to be reported at certain locations. Once submitted the report, which will include a detailed mitigation plan, will be reviewed and verified by our own acoustic consultant prior to us determining what to do next."

Andy Cole, Service Lead - Environmental Protection
North Devon District Council

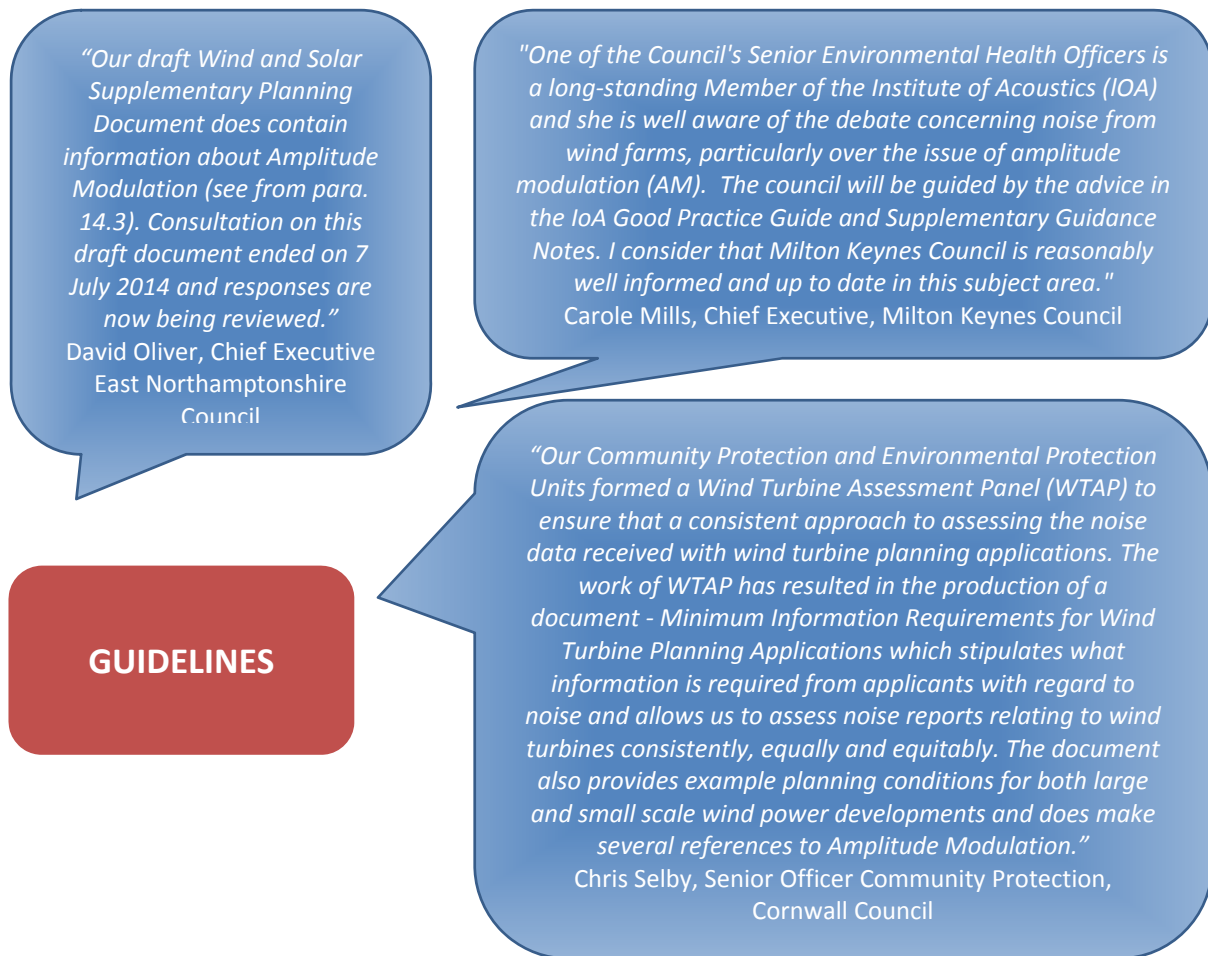
ACTIONS

"We try to apply controls to protect local residents against noise at the planning application stage. However, we have experienced difficulties in controlling applications for individual wind turbines, especially where other individual turbines exist in the area that have already received planning permission. We currently request that they meet a standard of lower than 35 db(A) at the nearest noise sensitive premises and take into account accumulative impact."

Tony Clark, Managing Director, Richmondshire District
Council

"Given the number of sites, we have relatively few noise complaints. It must however be recognised that this is largely due to the considerable amount of involvement which Environmental Health Officers have at the development stage of such applications. Without the continued ability to intervene at that stage it is likely that the noise produced from these wind farms would be subject to fewer control which would undoubtedly result in more complaints."

Sean Hall, Principle EHO (Environmental Protection), South Lakeland District Council



Summary & Conclusions on Mitigation

Where there have been noise only complaints (no element of EAM) the mitigating actions such as Abatement, Defect and Closure as described above have been conclusive and a solution has been achieved. However, where there have been AM complaints, as described in Curtailment and Pending above, there does not appear to be a conclusion. The Curtailment cases indicate further investigation and testing is taking place during curtailed operation. The only difference with the Pending cases is there has been no curtailment of the operation of the wind turbines whilst further investigation and testing takes place.

Two LPAs were specific about their 'prevention vs. cure' approach to proactively ensuring consultation on noise conditions at the pre-application stage. Since this could be a significant opportunity for proactive public protection, it is worth examining the full text from Richmondshire District Council: *"We try to apply controls to protect local residents against noise at the planning application stage. However, we have experienced difficulties in controlling applications for individual wind turbines, especially where other individual turbines exist in the area that have already received planning permission. We currently request that they meet a standard of lower than 35 db(A) at the nearest noise sensitive premises and take into account accumulative impact. Many applicants, including planning agents, have little understanding of noise issues which means the supporting information is*

lacking. Much of the manufacturers' details for the turbines themselves are from countries outside the UK which do not apply the same noise criteria or recognise noise impact in the way we do. Officers are always wary that in trying to determine an application there are inconsistencies with the original data presented and so protection they would like to provide to local residents may not always be achieved in practice."

This indicates a frustration about the consistency and availability of reliable support information on noise and AM, and a potential risk to public protection.

From this we can conclude:

1. There does not appear to be a standard approach across LPAs for curtailment of operation when AM complaints are identified;
2. None of the LPAs quoted here have described a clear definition of potential mitigation for AM;
3. The adoption of well-informed guidance on detecting and remedying AM is highly desirable;
4. Prevention may be better than cure and for this to be achieved, more consistent and reliable information is required about noise/AM and its causes.

Section 6 – Getting to Grips with AM

In his letter, Chris Heaton-Harris tells LPAs:

“The combined research confirms all large wind turbines can cause AM problems and warrant control by way of a planning condition. The debate over the form of control needed continues”.

How aware are the LPA respondents about AM? What guidance and support are they seeking on AM? What frustrations are they experiencing? What ideas do they have to offer on wind turbines?

Aware: LPA respondents describe how and what they know about AM (33 examples)

Guidance: LPAs asking for guidance, national standards and consistency in dealing with AM (8 examples)

Frustrations: LPAs express their frustration on the inadequacy of protection from noise/AM (3 examples)

Ideas: An idea from a Chief Executive who looks at the broader picture (1 example)

“We were not able to substantiate a complaint about noise as the complainant withdrew the complaint when it was realised that it may impact on any future sale of his property”.

Simon Joynes, Chartered Environmental Health Practitioner, Central Bedfordshire Council

“We too are aware of concerns regarding noise and the phenomenon of 'Amplitude Modulation' (AM). We have found that AM is detectable by its tonal characteristic as well as its volume and this has allowed our intervention within existing powers, even where there is no safeguarding condition.”

Lynn Aisbett, Chief Executive, Melton Borough Council

“I am aware of the issues of A.M. noise from large-scale turbine developments, and indeed have been following with interest the reports in relation to the Den Brook wind farm.”

Mr Kerry Pitt-Kerby, Manager, Environmental Protection & Private Sector Housing, North Dorset District Council

AWARE

“I am also aware of Amplitude Modification being discussed on a regular basis through trade publications such as Acoustics Bulletin through the Institute of Acoustics website (www.ioa.org.uk) where a number of professionals discuss research into this worldwide issue.”

Tim Nichols, Head of Environmental Health and Licensing, Brighton and Hove City Council

“As an acoustician I am well aware of the issues raised in your letter and of the concerns with regard to wind farm noise particularly amplitude modulation and I share your concerns about these.”

Julian Smith, Divisional Environmental Health Officer, Wycombe District Council

“I can confirm that the Council is fully aware of the issue in respect of amplitude modulation (AM). However, your letter is helpful, particularly the reference to the condition applied at the Den Brook wind farm and I have forwarded on your letter to my Environmental Health officers for their information.”

Bill Murphy, Head of Planning & Regulatory Services, Isle of Wight Council

"Your letter was very timely as Council officers are currently looking at A.M. issues in connection with the proposed Navitus Bay Wind Farm. In answer to your questions, I am afraid we have very little experience in this area".
Dave Yates, Chief Executive,
New Forest District Council

"Whilst our Councils have not experienced issues associated with AM, I am aware that other local authorities have experienced problems and would welcome greater research and some nationally set/ agreed definitive standards."
James Buckingham, Corporate Manager - Environmental Protection & Planning Enforcement
Babergh District Council & Mid Suffolk District Council

GUIDANCE

"As a general comment on the matter, it is acknowledged that there is a current lack of agreed, tried and tested guidance on amplitude modulation. Planning conditions are currently relied upon to prevent any occurrence and it is understood that different Local Authorities may well be applying different wording and standards."
James Arnold, Joint Assistant Director - Planning & Environmental Health,
Bolsover District Council

"A significant amount of time was spent producing and agreeing the noise control conditions for one application of 19 x 3MW turbines. The potential for amplitude modulation (AM) was discussed. At that time it was felt that the issue of AM did not have sufficient evidence base to be able to adequately define AM or write conditions that would control it."
Steve Robinson, Chief Executive, Cheshire West and Chester

"In the case of the Kessingland turbines, the operators have made significant attempts to research the meteorological conditions which give rise to the phenomenon and taken steps to control the way the turbines operate under those conditions in an attempt to reduce the likelihood and extent of future incidence of AM noise. This has not been entirely successful partly because the absence of any clear understanding about the physical mechanisms which cause AM or any standard agreed method of recognising, predicting or mitigating it. Consequently, it is very difficult to challenge whether the "best practicable means" have been used, with the result that (in the case of Kessingland) proceedings for statutory nuisance would be likely to fail due to the 'best practicable means' having been employed to resolve the issue."
Stephen Baker, Chief Executive, Wavenev District Council

FRUSTRATIONS

"In the view of my EHO the latest proposed condition from the IOA (of which he is a member) is too complex, imprecise and virtually unenforceable. In his opinion a review of ETSU-97 is well overdue which should include sample planning conditions, including one for OAM condition which is relevant, precise and enforceable. I would be grateful if you would not identify this Authority in your report."
Chief Executive

"In Summary, taking all the circumstances and the amount and quality of all the evidence gathered into consideration we do not believe there is a realistic prospect of being able to demonstrate the existence, or likely recurrence, of a noise amounting to a statutory nuisance to the standard required to justify service of an abatement notice under the terms of section 80 of the Environmental Protection Act 1990.

We sought to bring our extensive and very direct experience in this field to bear in a recent application for planning consent for a very similar turbine just 14km from the Kessingland site, but despite our best efforts the Planning Inspector rejected our arguments about what we believed to be the very real risk of AM noise causing disturbance to residents and approved the application on appeal"

Stephen Baker, Chief Executive, Waveney District Council.

IDEAS

"May I offer some general thoughts and another way to approach this matter? I'm taking it that your general concern is over the inappropriate siting of wind farms. In a recent meeting with Brandon Lewis, I suggested there might be merit in having a land use category called 'Energy Generation'. We have land use category for houses; for industry; for retail. These sub-divide into different types of industry B 1, B2, B8 etc. Likewise different types of retail etc. My proposition is the absence of a land use category is an accident of history. When land use categories were established only the crown generated electricity. It used crown prerogative rather than the planning system. Similarly, the phenomenon of wind and solar farms is a relatively recent one. The energy ownership and generation landscape is different now, but the planning system just does not reflect that. It has not kept pace. If a land use category existed (and sub categories) then local authorities could better plan and control the sites that such activities take place on, and the types of activities that take place on them. A good ground for a planning application is that other better sites have been designated via the local plan and/or that the applicant's site does not meet the necessary criteria for such a use. By formalising a land use category it provides a discipline in terms of the policy criterion and studies and surveys necessary. So distance from residential, impact assessments on noise, visual amenity etc. all flow. Currently, local Windfarm applications pop-up on ad-hoc sites and are dealt with in an ad-hoc way. In effect, this is what we have done in Kettering and it seems to be working. I venture to suggest that if, and it is an if, what you seek is to stop unsuitable sites from coming forward, then perhaps the land use category might be helpful. After all, that's how we do it with every other type of planning application. I know Philip (Hollobone) supports this approach and you may care to talk to him. Alternatively, I would be happy to provide further information. I apologise if I have been presumptive in the foregoing. I'll leave you to judge the merits of this suggestion".

David Cook, Chief Executive, Kettering Borough Council

Summary & Conclusions on Getting to Grips with AM

Executives at all levels in Local Planning Authorities are aware of the issues and the debate on Amplitude Modulation. They keep themselves informed through public sources. In their minds this would appear to be currently an unresolved issue – that is, work in progress.

There is a requirement from Local Planning Authorities for precision and certainty in dealing with AM conditions and AM complaints. This would include:

1. More information and evidence on the causes of AM;
2. Reliable methods for predicting AM, especially at the planning application and conditions setting stage;
3. Sound guidance on measuring and testing;
4. Nationally set and agreed standards which are consistently applied
5. Proven mitigations for AM.

One EHO, through his Chief Executive and on condition of anonymity, has been very critical of the AM condition being proposed through the Institute of Acoustics. The same EHO believes ETSU-R-97 should be overhauled and include a condition for AM (*) which is *“relevant, precise and enforceable”*.

One Chief Executive has taken a broader strategic view of how to ensure the appropriate siting of industrial wind turbines through land use categories. From this idea he suggests *“distance from residential, impact assessments on noise, visual amenity etc. all flow”*. In many ways his idea is a more strategic version of the ‘prevention vs cure’ tactics described in the previous section.

(*)The EHO actually refers to ‘OAM’ – or Other Amplitude Modulation – which is a concept introduced in December 2013 by the industry body [Renewable UK](#).

Section 7 – Gaps & Omissions

Between them, the 195 responding Local Planning Authorities contributed over 18,000 words in response to Chris Heaton-Harris's letter. Some were very short. For example, simply 'No' to the two questions at the end of his letter. Some were formal replies in a Freedom of Information (FOI) format. Others were free-flowing, comprehensive and provide valuable insights into how Chief Executives, Senior Managers and Environmental Health Managers see the issues and current debate surrounding noise and Amplitude Modulation. Apart from one Chief Executive who asked for anonymity, respondents replying to an MP should expect, and perhaps want, their comments to be in the public domain. So, apart from the preceding sections in this Study, what other valuable conclusions can we deduce from this wealth of information?

Health

Given the volume of information provided by LPAs we can look at the information and safely ask 'What were the omissions - what did they not say?' Here is an example. In his letter Chris Heaton-Harris said: *"Constituents have made MPs increasingly aware of a range of noise problems, including sleep disturbance over recent years"* Despite this direct reference to the protection of people's health, only one LPA made a reference to this subject. The Chief Executive of Waveney & Suffolk Coast said: *"On four occasions, the noise emitted from the turbines has been adjudged in the opinion of the visiting officers to be of sufficient intensity in circumstances which was likely to cause significant interference with use and enjoyment of the complainant's property"*. LPAs have employees with titles such as 'Environmental Health Officer' and 'Public Health Protection Managers'. Is it possible that in focussing on meeting standards such as ETSU-R-97, LPAs have lost sight of their duty towards the public's health and well-being?

Mind the Gap

We have already seen from the introduction in Section 1 that there is an immense lacuna between the way in which opposing stakeholders see the issue and scale of noise from industrial wind turbines, in particular Amplitude Modulation (AM). For example, reUK have extrapolated the data from the 2007 Salford Report to suggest that 15 sites out of 521, just 3% would be affected by EAM. The Renewable Energy Foundation (REF) used a [Freedom of Information Request](#) in 2009 to establish the names and number of the wind farms in the 2007 Salford Report where local authorities were reporting AM. This amounted to four of the 27 studied where there were noise complaints (15%). Mike Stigwood of MAS Environmental claims: *"Potentially 80-160 wind farms are causing problems with 1,000s homes affected. Research shows Excess Amplitude Modulation (EAM) is the main problem and caused by all large wind farms."* In this 2014 Study we discover of 205 LPAs responding, 54 have received complaints about wind turbine noise and of those 17 were about AM (32%). In total there were over 600 individual complaints mostly clustered in the five year period 2010-14. But we do not know exactly how many wind farm or single turbine locations were involved, or their names. The current incidence of AM complaints are much higher than predicted by reUK and the Salford Report. If they are as high as Mike Stigwood of MAS suggests then there is a 'silent majority' out there knowing they are unhappy about some effect of their

neighbouring wind farm, but unsure of how to describe it, who to tell, or how to complain. The Central Bedfordshire EHO said a complainant withdrew their complaint when it was realised that it may impact on any future sale of their property. This also indicates there is a further 'silent majority' unwilling to complain for this and other reasons.

Community Charter

The evidence of this study is that even if they do complain, the response wind farm neighbours get will depend on their LPA. Some investigate and negotiate a curtailment of operation during the investigation. Some only investigate. Some do not appear to know what to do or how to do it. What would be highly desirable is a form of standard and agreed approach to a 'community charter' whereby wind farm neighbours know how to complain and what to expect. Could this be backed up by an Ombudsman service?

Consider the response from the South Cambridgeshire EHO in which he refers to AM complaints about the Cotton Farm wind farm. Here it would appear an organised and determined local group of people have engaged with the LPA and the developer with substantial back up evidence.

Contrast this with Waveney & Suffolk Coastal District Council's (see Appendix C for the full text of the LPA response) where 465 individual complaints have been received from 44 residents from a total of 800 living within 1km of two turbines at Kessingland. In response the council's officers made 107 separate site visits. They found a potential noise nuisance on only four of the 107 visits. This indicates a scatter gun approach by wind farm neighbours doesn't work. It brings the complaints process into disrepute and fails to resolve the noise problem.

Communities which simply don't have the resources to complain effectively against a powerful adversary need and deserve the support of a 'community charter'.

Section 8 – Den Brook and Statutory Nuisance

It is appropriate to include in this Study the position regarding the Court of Appeal judgement in *Hulme v Secretary of State for Communities and Local Government and another* [2011]EWCA Civ 638 (the Den brook case) and how it has been applied in subsequent applications by Local Authorities and appeals by Planning Inspectors.

The Court of Appeal considered the validity of an AM condition drafted in the course of an appeal against the refusal of West Devon District Council to grant permission for a wind farm at Den Brook. While there are some unusual features in the way that this case proceeded before the Court, the following issues that arise from the judgment are important and relevant

1. The Court considered that a planning condition could be made on a “*precautionary*” basis. This was clearly considered to be the position by the judge in the High Court who was quoted with general approval by the Court of Appeal
2. The Court considered Circular 11/95 and must therefore have considered the criteria that planning conditions have to meet. This circular was considered in the High court by Patterson J (see paragraph 46) and was also mentioned in the Court of Appeal, albeit when commenting upon another judgement (see paragraph 24)
3. The Court specifically determined that the conditions imposed in the Den Brook case in relation to AM were enforceable. The Court mentioned enforcement in this judgement many times and came to the clear decision at paragraph 38 that the conditions were enforceable.

It is astounding that this judgement has since been systematically ignored in planning appeals. Worse, it has virtually been stated to be wrong and that the condition does not meet the necessary criteria to be legal, with wind industry practitioners claiming that the Court did not consider various issues, including it appears those mentioned above. In view of the doctrine of judicial precedent, only a Court (or Parliament) has the power to do that, not wind developers, local authority planners or planning inspectors.

Instead, the wind industry has persuaded local authorities and planning inspectors to say that statutory nuisance should be used to combat this issue. Statutory nuisance should not be used to fill a lacuna left by a lack of a planning condition. It is a cumbersome and expensive procedure and the defence of “*best practical means*” can make it very difficult to enforce. The authorities know this but have continued with this approach. The most recent example of this is a decision by the Secretary of State for Energy and Climate Change in his determination of the Clocaenog Wind Farm Consent Order made on 12 September 2014, even though he knew that some residences were likely to be severely affected by AM (see paragraphs 4.18 to 4.27) At paragraph 4.14 he noted the particular impact on three properties but considered that, under the Human Rights Act, the interference was “*proportionate and justified*”. This is an astounding comment.

The difficulties in enforcing Statutory Nuisance are exemplified in the response from Stephen Baker, Chief Executive of the combined Waveney and Suffolk Coastal District

Councils in Lowestoft, which is included at Appendix C. While Mr Baker may have considered most visits to the site did not show a statutory nuisance existed, he appears to be in no doubt that this was practically impossible to enforce when it did occur.

It is accepted that accept that the Den Brook condition may need some modification to make it clearer. But in view of the Den Brook judgement in the Court of Appeal, it is a valid type of condition that the authorities have unacceptably refused to contemplate. If they did use or suitably adapt it, then there is no need for the fall back onto Statutory Nuisance.

Appendix A: Chris Heaton-Harris Letter

Letter send from Chris Heaton-Harris MP to the named Chief Executive of 265 English LPAs

You may be aware of the work of fellow MPs and I to raise awareness of the problems of wind farm noise impacting upon local communities and our attempts to bring about a change in the way their control is approached. I write to update you on important changes over the understanding of noise problems, to ensure there is uniformity across the country.

Constituents have made MPs increasingly aware of a range of noise problems, including sleep disturbance over recent years and in particular a phenomenon known as amplitude modulation (AM), which noise engineers working for the wind industry had repeatedly denied as only a rare problem not warranting control. Indeed, one Environmental Health Officer from the South-West has reported how disturbing AM is.

In 2013, independent researchers demonstrated this problem was serious and extremely common. This work was supported by other independent research in Japan and finally, after the weight of supporting evidence became clear, industry experts released their own long awaited research confirming it was a significant problem warranting control and ending their previously successful attempts to prevent controls that left communities unprotected.

The combined research confirms all large wind turbines can cause AM problems and warrant control by way of a planning condition. The industry still argues over the frequency that this problem arises, but the extensive Japanese research has independently confirmed it is a common problem causing serious annoyance. Regrettably, almost all wind farms and turbines currently operating in the UK do so without controls over AM. If you are not familiar with this noise phenomenon, I understand some clips are available for viewing online. They are best listened to using good quality headphones at http://www.masenv.co.uk/listening_room. Noise near an operating wind farm can also be experienced at: http://www.masenv.co.uk/~remote_data/.

The debate over the form of control needed continues. I understand a condition has been proposed by industry representatives, but this has been independently tested against the largest databases of wind farm noise in the UK and shown it does not prevent AM. Therefore, it cannot be recommended. I understand the industry now accepts there are problems with their proposed condition. The only condition so far accepted by the courts as a means of control of AM, is the condition applied to the Den Brook wind farm, although, currently, the only means of stopping AM noise impact is to stop the turbines at the times it occurs.

The purpose of this letter is to ask whether you have had:

- 1. Any complaints about noise from wind turbines?*
- 2. If you have had reports of amplitude modulation?*

Finally, I'd like to know, if the answer to either of those two questions is positive, whether you found excessive noise or AM upon investigation and what actions you might have taken to mitigate the problem detected.

Many thanks in advance for your assistance on this matter.

Yours sincerely,

Appendix B: List of Local Planning Authorities Contacted

Log	Reply Date	Non-metropolitan Planning Authorities (England)
1	10/09/14	Adur District Council
2	18/08/14	Allerdale Borough Council
3	12/08/14	Amber Valley Borough Council
4	08/08/14	Arun District Council
5	15/08/14	Ashfield District Council
6	12/08/14	Ashford Borough Council
7	12/08/14	Aylesbury Vale District Council
8	22/08/14	Babergh District Council
9	27/08/14	Barrow-in-Furness Borough Council
10	16/09/14	Basildon District Council
11	18/08/14	Basingstoke & Deane Borough Council
12	11/08/14	Bassetlaw District Council
13	02/09/14	Bath & North East Somerset Council
14	18/08/14	Bedford Borough Council
15		Blaby District Council
16	15/08/14	Blackburn with Darwen Borough Council
17	18/08/14	Blackpool Council
18	10/09/14	Bolsover District Council
19	23/10/14	Boston Borough Council
20	08/09/14	Bournemouth Borough Council
21	12/08/14	Bracknell Forest Council
22	08/08/14	Braintree District Council
23	21/08/14	Breckland District Council
24	14/08/14	Brentwood Borough Council
25	14/08/14	Brighton and Hove City Council
26		Bristol City Council
27	30/10/14	Broadland District Council
28	18/08/14	Bromsgrove District Council
29		Broxbourne Council
30	08/08/14	Broxtowe Borough Council
31	12/08/14	Cambridge City Council
32	20/08/14	Cannock Chase District Council
33	09/08/14	Canterbury City Council
34	14/08/14	Carlisle City Council
35		Castle Point
36	11/08/14	Central Bedfordshire Council
37	28/08/14	Charnwood Borough Council
38	10/08/14	Chelmsford Borough Council
39	21/08/14	Cheltenham Borough Council
40		Cherwell District Council
41	14/08/14	Cheshire East

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Log	Reply Date	Non-metropolitan Planning Authorities (England)
42	12/09/14	Cheshire West and Chester
43		Chesterfield Borough Council
44	07/08/14	Chichester District Council
45	11/08/14	Chiltern District Council
46	12/08/14	Chorley Borough Council
47	07/08/14	Christchurch Borough Council
48	27/08/14	Colchester Borough Council
49		Copeland Borough Council
50	08/08/14	Corby Borough Council
51	14/08/14	Cornwall Council
52		Cotswold District Council
53	02/09/14	Durham County Council
54	21/08/14	Craven District Council
55	13/08/14	Crawley Borough Council
56	12/08/14	Dacorum Borough Council
57	01/12/14	Darlington Borough Council
58	07/08/14	Dartford Borough Council
59	14/08/14	Dartmoor National Park Authority
60	18/08/14	Daventry District Council
61		Derby City Council
62	13/08/14	Derbyshire Dales
63	03/09/14	Dover District Council
64	11/08/14	East Cambridgeshire
65	11/08/14	East Devon
66		East Dorset District Council
67		East Hampshire District Council
68	13/08/14	East Hertfordshire [East Herts Council]
69	19/08/14	East Lindsey District Council
70	18/08/14	East Northamptonshire Council
71	01/10/14	East Riding of Yorkshire Council
72	14/08/14	East Staffordshire Borough Council
73		Eastbourne Council
74	14/08/14	Eastleigh Borough Council
75	22/08/14	Eden District Council
76	13/08/14	Elmbridge Borough Council
77	07/08/14	Epping Forest District Council
78	11/08/14	Epsom & Ewell Borough Council
79	15/08/14	Erewash Borough
80	18/08/14	Exeter City
81	11/08/14	Exmoor National Park Authority
82		Fareham Borough Council
83	27/08/14	Fenland District Council
84	05/09/14	Forest Heath District Council

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Log	Reply Date	Non-metropolitan Planning Authorities (England)
85	18/08/14	Forest of Dean District Council
86	07/08/14	Fylde Borough Council
87	28/08/14	Gedling Borough Council
88		Gloucester City Council
89	12/08/14	Gosport Borough Council
90	07/08/14	Gravesham Borough Council
91		Great Yarmouth Borough Council
92	19/08/14	Guildford Borough Council
93		Hambleton
94	23/08/14	Harborough District Council
95	27/08/14	Harlow Council
96	14/08/14	Harrogate Borough Council
97	07/08/14	Hart District Council
98	11/08/14	Hartlepool Borough Council
99	26/08/14	Hastings Borough Council
100	08/08/14	Havant District Council
101		Herefordshire Council
102	08/08/14	Hertsmere Borough Council
103		High Peak Borough
104	19/08/14	Hinckley & Bosworth District Council
105	08/08/14	Horsham District Council
106		Huntingdonshire District Council
107	12/09/14	Hyndburn Borough Council
108	12/08/14	Ipswich Borough Council
109	13/08/14	Isle of Wight Council
110	07/08/14	Council of the Isles of Scilly
111	28/08/14	Kettering Borough Council
112	15/09/14	King's Lynn & West Norfolk Borough Council
113	23/10/14	Hull City Council
114		Lake District National Park Authority
115		Lancaster City Council
116	21/08/14	Leicester City Council
117	16/09/14	Lewes District Council
118	14/08/14	Lichfield District Council
119		Lincoln City Council
120	15/08/14	Luton Borough Council
121		Maidstone Borough Council
122	18/08/14	Maldon District Council
123	13/08/14	Malvern Hills District Council
124	21/08/14	Mansfield District Council
125		Medway Council
126	03/09/14	Melton Borough Council
127	13/08/14	Mendip District Council

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Log	Reply Date	Non-metropolitan Planning Authorities (England)
128	08/08/14	Mid Devon District Council
129	22/08/14	Mid Suffolk District Council
130	08/08/14	Mid Sussex District Council
131	19/08/14	Milton Keynes Council
132		Mole Valley Council
133	18/08/14	New Forest District Council
134	18/08/14	New Forest National Park Authority
135	20/08/14	Newark and Sherwood District Council
136	19/08/14	Newcastle-under-Lyme Council
137	28/08/14	North Devon District Council
138	11/08/14	North Dorset District Council
139	10/09/14	North East Derbyshire
140	27/08/14	North East Lincolnshire Council
141	12/08/14	North Hertfordshire District Council
142	28/10/14	North Kesteven District Council
143		North Lincolnshire Council
144	22/08/14	North Norfolk District Council
145		North Somerset Council
146	12/08/14	North Warwickshire Borough Council
147		North West Leicestershire
148	04/09/14	North York Moors National Park Authority
149	07/08/14	Northampton Borough Council
150	22/08/14	Northumberland County Council
151		Northumberland National Park Authority
152	14/08/14	Norwich City Council
153	12/08/14	Nottingham City Council
154	18/09/14	Nuneaton & Bedworth
155		Oadby & Wigston District Council
156		Oxford City Council
157		Peak District National Park Authority
158	08/09/14	Pendle Borough Council
159	11/08/14	Peterborough City Council
160	27/08/14	Plymouth City Council
161	08/08/14	Poole Borough Council
162	20/08/14	Portsmouth City Council
163		Preston City Council
164	14/08/14	Purbeck District Council
165	11/08/14	Reading Borough Council
166		Redcar and Cleveland
167	18/08/14	Redditch Borough Council
168		Reigate and Banstead Borough Council
169	01/09/14	Ribble Valley Borough Council
170	14/08/14	Richmondshire

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Log	Reply Date	Non-metropolitan Planning Authorities (England)
171	28/08/14	Rochford District Council
172		Rossendale
173		Rother District Council
174	13/08/14	Rugby Borough Council
175		Runnymede Borough Council
176	22/08/14	Rushcliffe Council
177	15/08/14	Rushmoor Borough Council
178	02/09/14	Rutland County Council
179	15/08/14	Ryedale District Council
180	27/08/14	Sandwell Metropolitan Borough Council
181	08/08/14	Scarborough Borough Council
182	21/08/14	Sedgemoor District Council
183		Selby
184	15/08/14	Sevenoaks District Council
185	18/08/14	Shepway District Council
186		Shropshire Council
187		Slough Borough Council
188	15/08/14	South Bucks District Council
189	12/09/14	South Cambridgeshire District Council
190	12/08/14	South Derbyshire
191	20/08/14	South Downs National Park Authority
192	18/08/14	South Gloucestershire District Council
193	27/08/14	South Hams District Council
194	21/08/14	South Holland
195	13/08/14	South Kesteven
196	14/08/14	South Lakeland District Council
197	14/08/14	South Norfolk
198		South Northamptonshire
199	11/08/14	South Oxfordshire District Council
200	03/09/14	South Ribble Borough Council
201	14/08/14	South Somerset District Council
202	14/08/14	South Staffordshire
203		Southampton City Council
204	18/08/14	Southend-on-Sea Council
205	11/08/14	Spelthorne Borough Council
206		St Albans City & District Council
207	05/09/14	St Edmundsbury Borough Council
208	27/08/14	Stafford Borough Council
209	28/08/14	Staffordshire Moorlands District Council
210	14/08/14	Stevenage Borough Council
211	20/08/14	Stockton-on-Tees Borough Council
212	29/08/14	Stoke-on-Trent City Council
213	14/08/14	Stratford-on-Avon

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Log	Reply Date	Non-metropolitan Planning Authorities (England)
214	02/09/14	Stroud District Council
215		Suffolk Coastal District Council
216		Surrey Heath Borough Council
217	15/09/14	Swale Borough Council
218	11/08/14	Swindon Borough Council
219	12/08/14	Tamworth Borough Council
220	15/08/14	Tandridge District Council
221	08/08/14	Taunton Deane Borough Council
222	05/09/14	Teignbridge District Council
223	22/08/14	Telford & Wrekin Council
224	14/08/14	Tendring District Council
225	11/08/14	Test Valley Borough Council
226	19/08/14	Tewkesbury Borough Council
227	18/08/14	Thanet District Council
228		The Broads Authority
229	11/08/14	Three Rivers District Council
230		Thurrock Council
231	21/08/14	Tonbridge and Malling Borough Council
232	28/08/14	Torbay Council
233	29/08/14	Torrige District Council
234	21/08/14	Tunbridge Wells Borough Council
235	08/08/14	Uttlesford District Council
236		Vale of White Horse District Council
237	27/08/14	Warrington Council
238	28/09/14	Warwick District Council
239	12/08/14	Watford Borough Council
240	11/08/14	Waveney & Suffolk Coastal District Councils
241	11/08/14	Waverley Borough Council
242	13/08/14	Wealden District Council
243	21/08/14	Wellingborough
244	13/08/14	Welwyn Hatfield Council
245	18/08/14	West Berkshire Council
246	08/09/14	West Devon Borough Council
247		West Dorset District Council
248	19/11/13	West Lancashire District Council
249	08/08/14	West Lindsey
250		West Oxfordshire
251		West Somerset
252		Weymouth & Portland Borough Council
253		Wiltshire Council
254		Winchester City Council
255	12/08/14	Royal Borough of Windsor and Maidenhead
256	07/08/14	Woking Borough Council

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Log	Reply Date	Non-metropolitan Planning Authorities (England)
257	15/08/14	Wokingham Council
258	12/08/14	Worcester City Council
259		Worthing Borough Council
260	18/08/14	Wychavon District Council
261	12/08/14	Wycombe District Council
262	06/10/14	Wyre Borough Council
263		Wyre Forest District Council
264	14/08/14	City of York
265	08/08/14	Yorkshire Dales National Park Authority

Appendix C: Waveney District Council in Partnership with Suffolk Coastal District Council Response

Response from Stephen Baker, Chief Executive of the combined Waveney and Suffolk Coastal District Councils in Lowestoft.

Freedom of Information/ Environmental Information Request- 14082 (WDC)

Request:

Have you had:

1. Any complaints about noise from wind turbines?
2. Any reports of amplitude modulation?

If the answer to either of those two questions is positive whether you found excessive noise or AM upon investigation and what actions you might have taken to mitigate the problem detected.

Response:

We are aware of the research around AM noise to which you refer, and also the current debate around its validity and conclusions.

We have had complaints about noise from two turbines in Kessingland, which is just South of Lowestoft. We have investigated these complaints extensively and have experienced at first hand the effects of AM noise from both; indeed, we believe some of the recordings at www.masenv.co.uk are of those turbines.

As you will be aware, the Council is required under the terms of part 3 of the Environmental Protection Act 1990 to take "such steps as are reasonably practicable" to investigate these complaints. In pursuance of this, Council Officers have visited residents' homes and the general area of those turbines, sometimes on receipt of a complaint and sometimes on their own recognisance. Complaint logs have been correlated against meteorological data to attempt to determine under what conditions noise problems arise and the results of this analysis have been used to try to anticipate problems and plan monitoring.

During some such visits, sound recordings and noise measurement data has been collected. Those recordings included a period of 9 consecutive days when a complainant hosted a recording device inside the bedroom of a dwelling and made a series of 45 digital sound recordings, each of 30 seconds duration at times when a perceived problem existed. These recordings were reviewed first by our own Officers and subsequently independently reviewed by external experts. These particular recordings did not yield evidence of any significant contribution from turbine noise and neither did they provide any evidence supporting the existence of a noise amounting to a statutory nuisance.

A brief summary of our investigations to date is as follows:

There are approximately 800 residential properties within 1 km of these turbines. In total, we have been contacted by 44 residents about noise.

These 44 individuals have contacted us on 465 separate occasions since the turbines were commissioned. Council officers have visited complainants' homes or the general area on 107 occasions.

- o 13% of our officers' visits have taken place within 1 hour of a resident's complaint,
- o 24% have taken place within 2 hours;
- o 33% have taken place within 4 hours;
- o 37% have taken place within 8 hours;
- o 54% have taken place within 24 hours.

On four occasions, the noise emitted from the turbines has been adjudged in the opinion of the visiting officers to be of sufficient intensity in circumstances which was likely to cause significant interference with use and enjoyment of the complainant's property.

On the remainder of these occasions, the noise emissions were not judged as representing, or likely to represent a significant interference.

On a number of occasions, visits shortly after the time of the complaint have resulted in no significant noise emissions being noted by the visiting officer, suggesting an over-sensitive response on the part of affected individuals, casting doubt on the reliability of their observations and their evidential value.

On one occasion, the turbines were found to be inoperative in effectively windless conditions. This was verified not only by the direct observations of the officer attending, but also by cross referencing the time and date of the complaint with the hub data provided by the turbine operators, once again casting significant doubt on the reliability of the observations of the individuals concerned and their evidential value.

I should add that it has been demonstrated beyond doubt that these turbines operate within the parameters set by the noise condition attached to their planning consent.

Whether or not we do find ourselves in a position to take legal action, there is a significant obstacle to achieving resolution through the statutory powers available to the Council; namely, the "best practicable means" defence made available under the terms of section 82(9) of the Environmental Protection Act 1990, which provides a turbine operator with a defence against proceedings for nuisance if they have taken the "best practicable means" to prevent or counteract the effects of the nuisance.

In the case of the Kessingland turbines, the operators have made significant attempts to research the meteorological conditions which give rise to the phenomenon and taken steps to control the way the turbines operate under those conditions in an attempt to reduce the likelihood and extent of future incidence of AM noise.

This has not been entirely successful partly because the absence of any clear understanding about the physical mechanisms which cause AM or any standard agreed method of recognising, predicting or mitigating it. Consequently, it is very difficult to challenge whether the "best practicable means" have been used, with the result that (in the case of

Kessingland) proceedings for statutory nuisance would be likely to fail due to the "best practicable means" having been employed to resolve the issue.

In Summary, taking all the circumstances and the amount and quality of all the evidence gathered into consideration we do not believe there is a realistic prospect of being able to demonstrate the existence, or likely recurrence, of a noise amounting to a statutory nuisance to the standard required to justify service of an abatement notice under the terms of section 80 of the Environmental Protection Act 1990.

We sought to bring our extensive and very direct experience in this field to bear in a recent application for planning consent for a very similar turbine just 14km from the Kessingland site, but despite our best efforts the Planning Inspector rejected our arguments about what we believed to be the very real risk of AM noise causing disturbance to residents and approved the application on appeal.

Appendix D: List of LPAs Receiving Noise & AM Complaints

Non-metropolitan Planning Authorities (England)	Noise Complaints?	AM Complaints?
Allerdale Borough Council	Yes	Yes
Amber Valley Borough Council	Yes	No
Babergh District Council	Yes	No
Barrow-in-Furness Borough Council	Yes	Yes
Bassetlaw District Council	Yes	No
Bath & North East Somerset Council	Yes	No
Blackburn with Darwen Borough Council	Yes	No
Bolsover District Council	Yes	No
Boston Borough Council	Yes	No
Braintree District Council	Yes	No
Breckland District Council	Yes	No
Brighton and Hove City Council	Yes	No
Broadland District Council	Yes	Yes
Central Bedfordshire Council	Yes	No
Cornwall Council	Yes	Yes
Darlington Borough Council	Yes	No
East Riding of Yorkshire Council	Yes	Yes
East Staffordshire Borough Council	Yes	No
Gedling Borough Council	Yes	No
Harrogate Borough Council	Yes	No
Hull City Council	Yes	No
King's Lynn & West Norfolk Borough Council	Yes	No
Lewes District Council	Yes	No
Maldon District Council	Yes	Unclear
Melton Borough Council	Yes	Unstated
Mendip District Council	Yes	Yes
Mid Devon District Council	Yes	No
Mid Suffolk District Council	Yes	No

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Non-metropolitan Planning Authorities (England)	Noise Complaints?	AM Complaints?
Milton Keynes Council	Yes	No
New Forest District Council	Yes	Unstated
Newark and Sherwood District Council	Yes	Yes
North Devon District Council	Yes	Yes
North East Derbyshire	Yes	No
North Kesteven District Council	Yes	No
Northumberland County Council	Yes	Yes
Pendle Borough Council	Yes	Yes
Plymouth City Council	Yes	No
Purbeck District Council	Yes	No
South Cambridgeshire District Council	Yes	Yes
South Gloucestershire District Council	Yes	No
South Hams District Council	Yes	No
South Holland	Yes	Yes
South Lakeland District Council	Yes	No
South Oxfordshire District Council	Yes	No
Staffordshire Moorlands District Council	Yes	Yes
Stroud District Council	Yes	Yes
Swale Borough Council	Yes	No
Teignbridge District Council	Yes	No
Tendring District Council	Yes	Yes
Test Valley Borough Council	Yes	No
Torridge District Council	Yes	Yes
Waveney & Suffolk Coastal District Councils	Yes	Yes
West Lancashire District Council	Yes	No
Wyre Borough Council	Yes	No

Appendix E: Known Wind Farm sites causing or known to have caused complaints

MAS Environmental Cambridge have compiled a list of over 30 wind farms across the UK that they are aware of as generating Amplitude Modulation (AM). See below.

MAS have currently measured unreasonable wind farm noise or been asked to investigate complaints of noise from wind farms at 13 developments including Bicker Fen, Blaen Bowi, Coldham, Darracott, Delabole, Fullabrook, [Deeping St Nicholas](#), [North Pickenham](#), [Red Tile](#) and [Swaffham](#). The occurrence of AM is often noted by the industry as rare; the table below contains only wind farms generating AM of which MAS are aware due to written evidence. MAS understand there are many other cases. As can be seen from the table below, the occurrence of AM is not specific to turbine make, model, size, rated power or number of turbines.

Table last updated August 2014

From: [http://www.masenv.co.uk/Operational Wind Farms](http://www.masenv.co.uk/Operational_Wind_Farms)

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Wind Farm	Location	MW per turbine	No. of turbines	Hub Height (m)	Reference	English LPA
Aggregate Ind Newquay	Cornwall	0.5MW	1	59	Audio examined	Cornwall
Askham	Cumbria	660kW	7	40	Salford - clear case added	Eden District Council
Bears Down	Cornwall	600kW	16	30	Salford - clear case added, recent complaints from residents	Cornwall
Bicker Fen	Lincolnshire	2MW	13	59	Statement from complainant - clear case	Boston Borough Council
Carland Cross	Cornwall	400kw	15	30	In ETSU-R-97 and Salford - now repowering and complaints received from residents	Cornwall
Coal Clough	Lancashire	400kw	24	30	In ETSU-R-97 missed in Salford	Burnley Borough Council
Cold Northcott	Cornwall	300kw	22	25	In ETSU-R-97 - in Salford but not added by them	Cornwall
Coldham	Cambridgeshire	1.75MW	8	60	Statements from complainant matches AM	Fenland District Council

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Wind Farm	Location	MW per turbine	No. of turbines	Hub Height (m)	Reference	English LPA
Conisholme	East Midlands	800kW	20	65	Evidence from others	East Lindsey District Council
Cregan Gate	Cornwall	50kW	1	25	Complaints from residents	Cornwall
Cotton Farm	East Anglia	2MW	8	80	MAS have measured EAM	Huntingdonshire District Council
Darracott	Devon	850kW	3	50	Complaints by residents of AM clearly ID AM	Torrige District Council
Deeping St Nicholas	Lincolnshire	2MW	8	59	In Salford and added, MAS confirmed	South Holland District Council
Delabole	Cornwall	2.3MW	4	99 (tip)	Direct complaints and advice of acoustician	Cornwall
Site C / D / E	ANON			64	MAS have measured EAM	
Site F	ANON	275kW	1	55	MAS have measured EAM and significant tonality	
Forestmoor, Bradworthy	Devon	1MW	3	48	Evidence of others	Torrige District Council
Four Burrows	Cornwall	300kW	15	30	In Salford - 'another' noise complained of	Cornwall
Fullabrook	Devon	3MW	22	65	Complaints by many residents of AM, post Salford	North Devon Council
Gedney Marsh (Red House)	Lincolnshire	2MW	6	59	Indirect evidence	South Holland District Council
Glyndebourne	Lewes District	850kW	1	44	Independent source - see also article in Private Eye No.1334	Lewes District Council
Harlock Hill	Cumbria	500kW	5	35	In Salford, but no direct evidence	Barrow-in-Furness Borough Council
Hazlehead	Yorkshire	2MW	3	60	Indirect complaints from residents - developer undertaking monitoring	Barnsley Metropolitan Borough Council
High Volts	County Durham	2750kW	3	60	Indirect evidence	Hartlepool Borough Council
Kessingland	Suffolk	2.05MW	2	80	Complaints and MAS measured, post Salford	Waveney District Council
Knabs Ridge	North Yorkshire	2MW	8	58	Complaints and MAS measured - post Salford	Harrogate Borough Council

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Wind Farm	Location	MW per turbine	No. of turbines	Hub Height (m)	Reference	English LPA
Lissett	Yorkshire	2.5MW	12	80	Controls introduced to reduce noise	East Riding of Yorkshire
Lowermoor Water Treatment Works	Cornwall	100kW	1	30	Direct complaint from resident	Cornwall
Lynch Knoll	Gloucestershire	500kW	1	42	In Salford but not added	Stroud District Council
Lynemouth	Northumberland	2MW	13	78	Indirect evidence / information	Northumberland County Council
Mablethorpe	Lincolnshire	600kW	2	65	Indirect evidence	East Lindsey District Council
Site N	ANON	50kW	1	23.6	MAS have measured EAM and significant tonality	
North Pickenham	Norfolk	1.8MW	8	80	MAS measured - residents not complaining officially	Breckland District Council
Red Tile / Warboys	Cambridgeshire	2MW	12	59	MAS measured and complaints - missed by Salford	Huntingdonshire District Council
Roscarnick Farm	Cornwall	275kW	1	32	Reported by residents as 'thumpy', turbine off much of the time	Cornwall
Royd Moor	South Yorkshire	500kW	13	35	In Salford but not added, MAS heard	Barnsley Metropolitan Borough Council
Six Penny Wood	East Riding of Yorkshire	2MW	10	80	Confirmed by residents, complaints to LA, compliance measurements	East Riding of Yorkshire Council
South Sharpley	Easington District	1.3MW	2	65	Evidence from affected residents	Durham County Council
St Breock	Cornwall	450kW	11	35	In Salford but not added	Cornwall
Swaffham	Norfolk	1.8MW	1	67	Complaints and MAS measured, missed by Salford	Breckland District Council
Swinford	Leicestershire	2MW	11	80	MAS have measured EAM	Harborough District Council
Tallentire	Cumbria	2MW	6	80	Direct complaint information	Allerdale Borough Council
Wadlow	Cambridgeshire	2MW	13	80	MAS have measured and confirmed with direct observations	South Cambridgeshire District Council

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Wind Farm	Location	MW per turbine	No. of turbines	Hub Height (m)	Reference	English LPA
Walkway Wind Farm	Sedgefield District	2MW	7	69	Evidence from affected resident clearly identifies AM	Sedgefield Borough Council
Wharrels Hill, Bothel	Cumbria	1.3MW	8	76	Complaints by residents of AM, post Salford	Allerdale Borough Council
Whittlesey	Cambridgeshire	1.8MW	1	80	Turned off at night	Fenland District Council
Site X	North East England	ANON	15+	ANON	Direct complaint evidence and measured data	

Many references derive from a study by Salford University in 2007. Reference to "not added" or "added" means that there was evidence of AM but Salford did or did not include it as AM related in their study. "MAS have no direct evidence" means we have not been able to verify the likelihood that complaints relate to AM.