Odour impact assessment for proposed additional livestock housing to complement the existing buildings at Lyme House Farm

14th June 2018

1.0 Introduction

This report has been requested by the Ribble Valley (RVBC) planning department following the consultation response received from the Environmental Health Department (EH) on 11th June 2018. The two current applications 3/2018/0374 and 3/2018/0376 are being considered separately by the planning officer. The request for this report also includes the requirement to refer to two previous applications to which were approved with no objections.
This report considers all aspects.

It is understood that there is a requirement to consider the cumulative effect of odour. This will be assessed in relation to each of the two buildings and two extensions. In effect the two buildings have been approved for construction and the two extensions are pending a decision by the 22nd June.

For the purposes of this report the first two buildings already approved will be considered as additional new cattle housing and therefore a possible odour source. It is understood that the current two proposals will be mitigated by activating a planning consent which takes older buildings and an open feed yard out of use permanently. It would be reasonable to assume these will no longer be a possible future odour source.

Information will be presented for the background odour from other sources in the general locality and from the existing cattle buildings. Comment and diagrams will be provided showing the range of local meteorological conditions and possible effects on the subject sources and other local sources.

A breakdown of an odour data model for each of the two building approvals and two extensions to buildings will be provided. In addition an odour data model will be provided for the existing cattle buildings which form part of the background sources. Comment will be made on the likely atmospheric dispersion model results in relation to dispersion near sources. Also commented on are the likely levels as they reduce, including at identified local receptors some significant distance away.

To bring the assessment to a conclusion, comment will be made on the cumulative effect, dispersion over distance and the relation to benchmark levels by the time odour reaches the identified receptors.

2.0 Background details

Lyme House Farm is situated 3.5km north of the town of Longridge with access from Elm Brow also known as Chipping Road. The farm is situated in and at the south end of the Hodder Valley and has particular local meteorological conditions which differ from those at Longridge. The holding supports a dairy herd which has been established on the holding over three generations. The farm buildings are located 200m south east of the unclassified highway Elm Brow also known as Chipping Road.

There are three ages of farm building with the oldest being eighteenth century. These are to be taken out of the production equation and hence the current proposals for building extensions. The new buildings will lie close to the north west side of the existing farm buildings and therefore any directional effects will be similar to the existing odour sources. The new buildings will have a diverse range of ventilation, including timber space boarding, vented ridge and clad doors which can be adjusted from time to time. The range of ventilation techniques aid the dispersion of odours at different heights and ensure there is no particular concentrated point source.

The subject buildings are at 96m above sea level with level grassland over the 200m distance to the nearest identified receptors. There are no commercial premises near to the farm other than a number of other livestock farms. Some of these local livestock farms lie in the main wind directions are predominantly from the SW (south west), WSW and SSW and therefore will provide some minimal background effect at the subject identified receptors. It is unlikely that these levels will be separately identifiable at such a distance but even these low levels will raise the sensitivity baseline at the identified receptors.

There are some local residences identified as the receptors whose occupants have also been consulted as part of the planning process. No objections were received during the statutory consultation period and no comments have been made at any other date in the past. These dwellings comprise the former farmstead known as Arbour Farm and include six properties and one annexe. Table 1 below indicates the receptor properties, distance from the subject source, direction from source and five year average percentage of wind share :

Table 1

Receptor address	Distance from source	Direction of source	Average wind share
Arbour Farm	200 m	South East	2.25%
Arbour Court	200 m	South East	2.25%
Arbour Cottage	200 m	South East	2.25%
Arbour Croft	200m	South East	2.25%
Arbour Fold	200 m	South East	2.25%
Arbour Barn	200 m	South East	2.25%
Arbour Barn Annexe	200 m	South East	2.25%

3.0 Methodology

3.1 Assessment of background odour sources

The identified receptors are all located immediately adjacent to the unclassified road Elm Brow also known as Chipping Road. The main wind directions are west through to south being 60% of the average wind directions over a five year period. This brings in low background levels of odour from other livestock farms. During the summer months receptor occupiers are more likely to be out in their gardens. This will desensitise the occupiers at the receptor locations. The meteorological wind from the south west is dominant but this is added to by the regular sea breeze effect from the west and the valley wind effect drawing air into the Hodder Valley. Image 1 shows the local wind rose data on an annual five year average. Other meteorological data is set out in Appendix 1

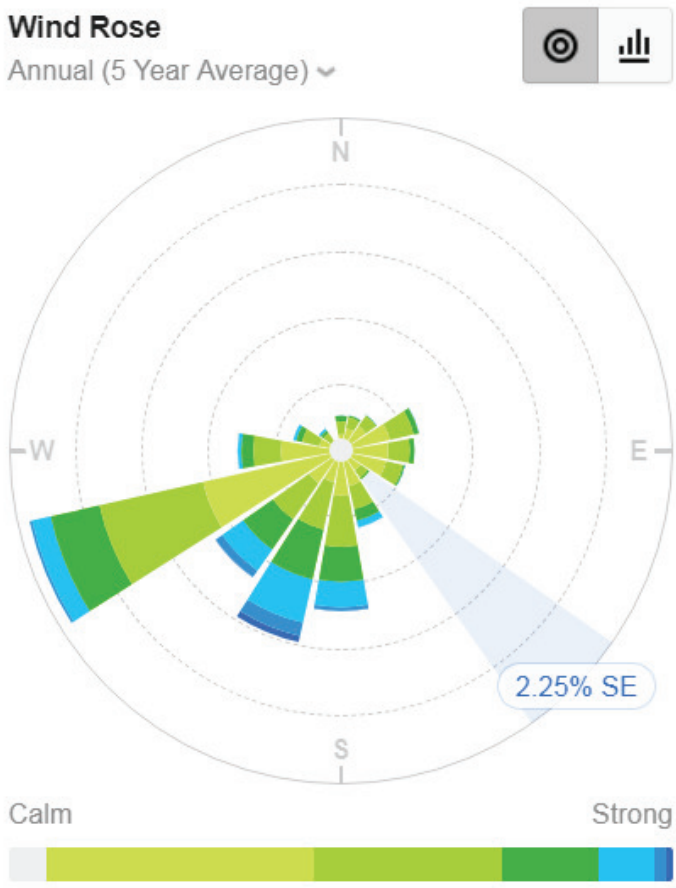


Image 1

The south east (2.25%) direction is unlikely to remain established for more than the morning period due to the effects described above. The existing background levels at source from the subject farm are set out in Table 2 below. These levels have been modelled to disperse significantly to acceptable levels in the initial 50 metres distance. There is a further reduction to negligible levels by 150m distance from source.

Table 2

Livestock Building	Odour emission cattle data	Emission data $ou_E\ s^{-1}\ t_{LW}^{-1}$	Area m^2	Area odour emission rate $ou_E\ m^{-2}\ s^{-1}$
Existing cubicle buildings	224	24	1632	3.29
Dry cow cubicles	45	24	500	2.16
Heifer housing	120	16	455	4.22
Old cow housing & feed yard	112	24	844	3.19

The existing source buildings and cattle numbers have been in place since 2014 so there has been a four year period of full operational capacity. The part background source shown in green in Table 2 comprises livestock which are proposed to be relocated to occupy the building extensions currently being considered. These numbers are also reflected at the proposed location in the subject odour sources Table 3. There have been no comments or complaints which substantiates the model being accurate for the sensitivity of the current occupiers at the identified receptors.

The total background odour levels having dispersed from all sources including the existing livestock buildings have dispersed to negligible levels on reaching the receptors. Such levels are well below the published figures for moderately offensive odours. It should be noted that this type of livestock enterprise is not uncommon in the locality so would not identify, as would a single poultry unit or pig enterprise for example. The background levels will be referred to again in the conclusion where the overall cumulative effect will be appraised.

3.2 Assessment of subject odour sources

As in the modelling of the background sources meteorological data is key to the chances of a directional disperse of odour to affect the receptors which are all in a narrow wind sector. Image 2 below shows the south east sector wind required to cause any effect which can be reasonably be modelled in the selected direction. It is clear that a five year average of 2.25% amounts to a number of part days or eight days per annum. There is also a significant thermal updraft effect caused by the local differentials in land cover. In the event of a measurable odour being modelled or even detected beyond the 50 metre disperse radius from source it is not anticipated to remain constant by direction or be recorded for more than a relatively short period of time.

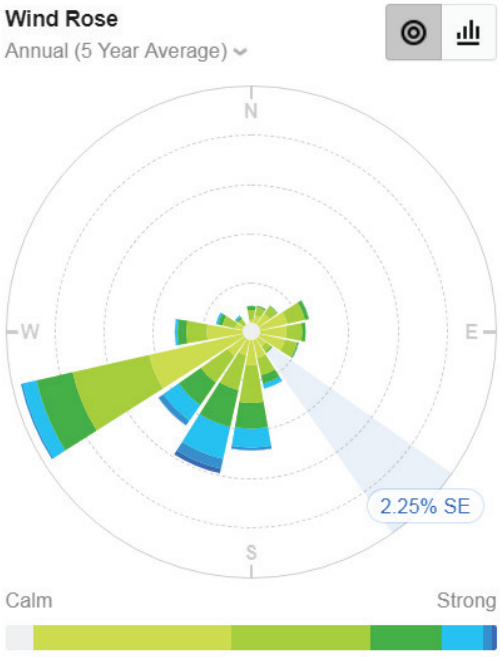


Image 2

The subject odour sources include two livestock buildings where the cattle numbers are anticipated to increase over the next twelve months. A number of heifers will enter the herd over and above the cull rate requiring the two buildings already approved. These numbers and areas are shown red in Table 3 below. This comprises the cumulative effect this report is seeking to identify.

Table 3

Livestock Building	Odour emission cattle data	Emission data $ou_E\ s^{-1}\ t_{LW}^{-1}$	Area m^2	Area odour emission rate $ou_E\ m^{-2}\ s^{-1}$
3/2018/0124 (approved)	56	24	421	3.19
3/2018/0151 (approved)	56	24	421	3.19
3/2018/0374 (extends 0124)	56	24	421	3.19
3/2018/0376 (extends 0151)	56	24	421	3.19

4.0 Discussion of Results

The relatively modest expansion of the cattle herd can be quantified by the 15% increase in mature cattle numbers, a 24% increase in building area but only a 16.4% increase in odour emissions at source. Key to the assessment of calculated cumulative effect is the dispersion rate continues to meet levels below 5 $ou_e m^3$ by the 50 metres distance from source and below 1.5 $ou_e m^3$ by the 150 metres distance from source. Table 1 showed all of the identified receptors to be 200m from the subject source and Image 2 shows meteorological effects at 2.25% of possible directional inputs.

At some distance from a source it would be unusual if odour concentration remained constant for an hour and in reality, due to air turbulence and changes in wind direction, short term fluctuations in concentration are observed. Therefore, although average exposure levels may be below the detection threshold, or a particular guideline, the receptors may be exposed to short term concentrations which are higher than the hourly average.

It should be noted that a fluctuating odour is often more noticeable than a steady background odour at a low concentration. It is implicit that within the models hourly averaging time and the Environment Agency guidelines and findings from UKWIR that there would be variation in the odour concentration around this mean, i.e. there would be short periods when odour concentration would be higher than the mean and lower than the mean.

5.0 Conclusions

Odour emission rates from the existing and proposed livestock buildings have been assessed and quantified based upon an emissions model that takes into account the likely source odour concentrations and ventilation rates of the buildings. The odour emission rates obtained have then been used as inputs to an atmospheric dispersion model which calculates odour exposure levels in the surrounding area.

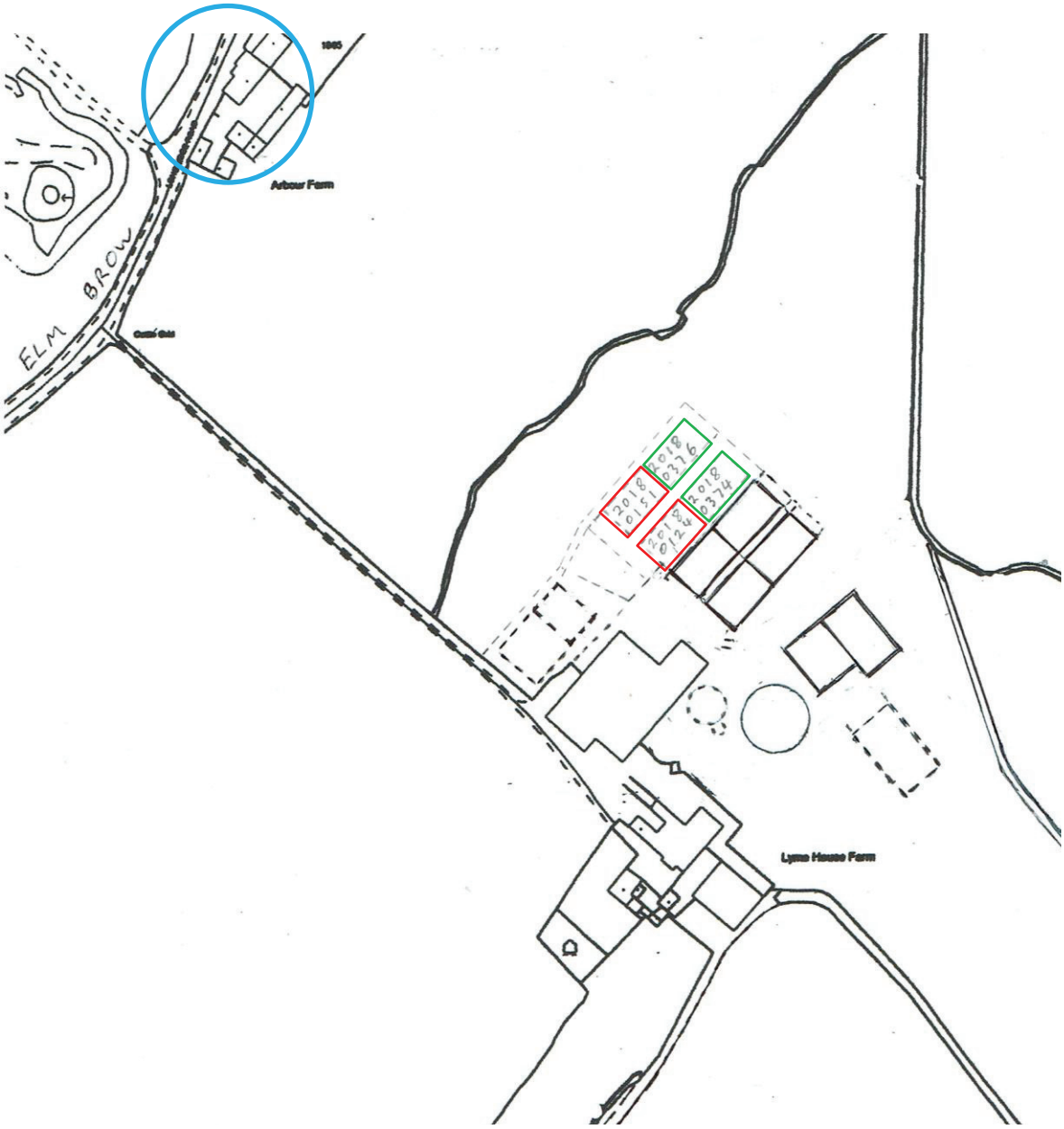
The background levels have been assessed and taken into consideration with other local effects, in particular local meteorological conditions.

As requested a cumulative effect has been considered. While a cumulative effect has been calculated at source there is no perceived effect at distances of over 150 metres from sources including at additional receptor locations.

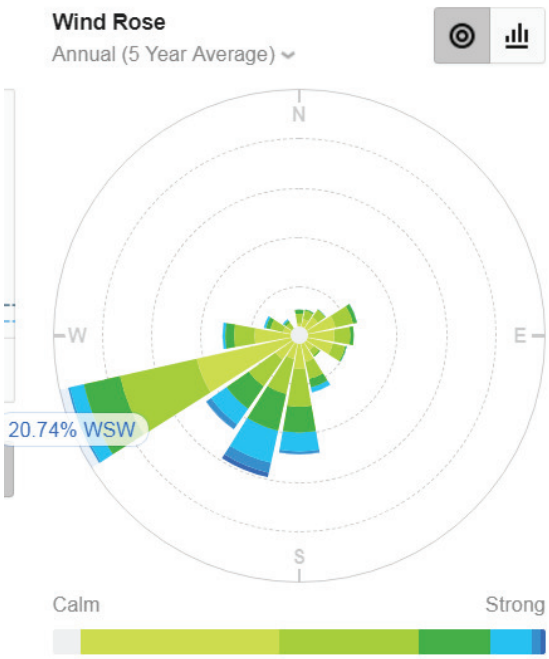
The modelling predicts that at all of the six residential receptors considered, the odour exposures would be below the Environment Agency's benchmark for moderately offensive odours, a 98th percentile hourly mean of 3.0 $ou_e m^3$ over a one year period.

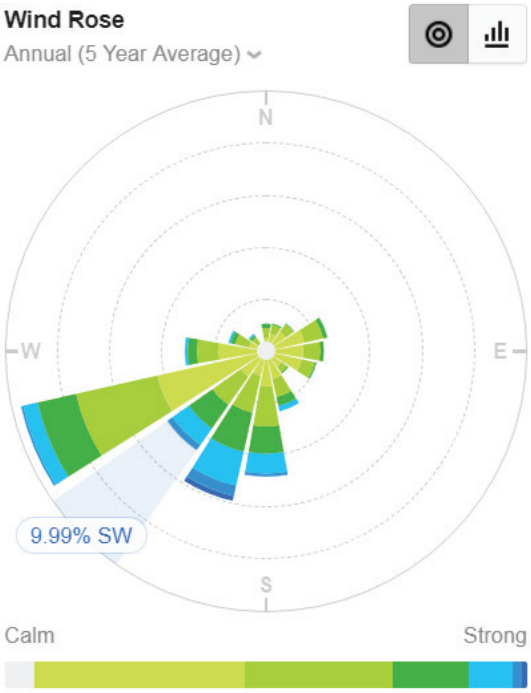
Plan of the receptor locations (blue), farm buildings source (red) and proposed extensions (green)

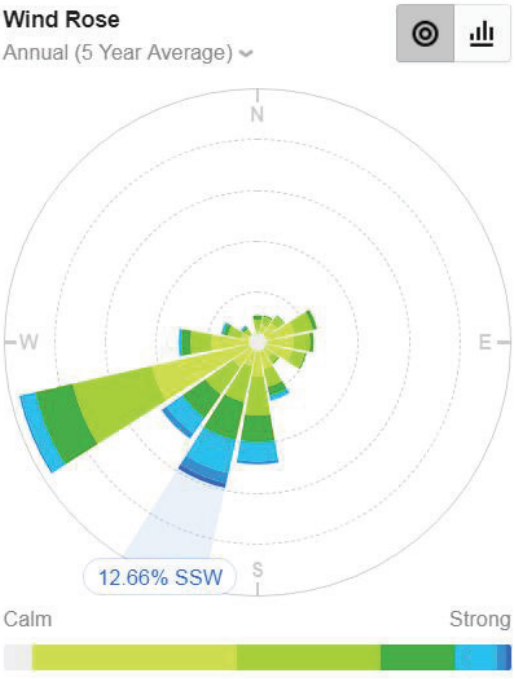
Scale 1 : 2500



Appendix 1 – Background Meteorological data, nearest location Chipping 2.5km







Appendix 1 – Effect and Background Meteorological data, nearest location Chipping 2.5km