AECOM Environment

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Land at Ashbourne Road, Buxton
Noise Assessment

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1 Introduction

1.1 Introduction

AECOM Ltd. has been tasked to carry out a noise impact assessment for a proposed mixed use development comprising of residential, commercial and community facilities at Foxlow Farm, Buxton.

The development site is split into two areas, one consisting of land for residential development (up to 375 dwellings) and residential care and / or retirement facility(up to 70 units and ancillary units) and a second smaller area, a local centre (2 ha) marked for employment and community use, together with associated access, car parking, open space and landscaping.

The local centre comprises of:

- up to 600 sqm of retail uses to be occupied for any use or combination of uses within classes A1 – A3 of the TCPO 2010 (such as retail uses);
- up to 580 sqm of retail uses to be occupied for any use within class A4 of the TCPO 2010 (such as restaurant uses);
- up to 1,000 sqm of business use to be occupied for any use or combination of uses within class B1 of the TCPO 2010; and
- up to 1,000 sqm of community uses to be occupied for any use or combination of uses within class D1 of the TCPO 2010 (such as a health centre, nursery or community use).

This report addresses the potential impacts that the proposed development may have on the local noise environment on and off-site together with the potential impact of existing noise sources on the proposed new residential properties and other potentially sensitive uses within the proposed development site.

The assessment comprises of the following elements:

1 A summary of the existing noise and vibration baseline conditions.

2 The potential impact of existing and future noise conditions on the development.

3 The likely significant impacts of the development on existing and future noise and vibration sensitive premises in the vicinity of the development site due to:
   - changes in road traffic flows; and
   - on-site operational activities and fixed plant.

4 Where appropriate, mitigation measures are recommended.

A glossary of acoustic terminology used in this report can be found in Appendix A.

2 Policy Context

2.1 National Policy

The National Planning Policy Framework was published on 27 March 2012 and replaced the previous Planning Policy Statements (PPS) including Planning Policy Guidance 24 Planning and Noise (PPG 24). The National Planning Policy Framework advises that:

1 "*Paragraph 109: The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability;"*

2 *"Paragraph 123: Planning policies and decisions should aim to avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development; mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions; recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established; and, identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason*."

Previous National Policy guidance in England on 'Planning and Noise' was presented in PPG 24 and was the main guidance on noise and vibration for the production of development plans. Whilst withdrawn, it is still considered to contain technical advice relevant to this assessment. PPG 24 outlined the considerations to be taken into account in determining planning applications both for noise sensitive developments and for land uses which will generate noise; it introduced the concept of noise exposure categories for residential development, encouraged their use and recommended appropriate levels for exposure to different sources of noise; and, advised on the use of conditions to minimise the impact of noise.

PPG 24 considered the relationship between the planning system and industry and commerce with the objective of minimising noise and vibration impacts without providing unreasonable burdens on business and development. In regard to this development, the key aim is to provide adequate mitigation into the new noise and vibration sensitive land uses such that existing sources of high noise and vibration levels are minimised and acceptable acoustic conditions are achieved, such that future operation of the existing noise sources of noise and vibration are not unduly prejudiced.

Also of relevance is the Noise Policy Statement for England (NPSE). This document sets out a strategic vision for the management of noise issues. Two key policies are:

- The Government recognises that the effective management of noise requires a co-ordinated and long term approach that encompasses many aspects of modern society (Policy 1.2).
- The aim of this document is to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion (Policy 1.3).

2.2 Other Guidance

The following documents have been referred to as part of this assessment. Further details about the documents can be found in the Assessment Methodology (Chapter 3).

- Calculation of Road Traffic Noise (CRTN), 1988.
- Design Manual for Roads and Bridges Volume 11 Section 3 Part 7 HD 213/11 (revision 1) 'Noise and Vibration.
- BS 4142:1997 'Method for rating industrial noise affecting mixed residential and industrial areas'.
- BS 7445: 2003 'Description and measurement of environmental noise, Part 1: Guide to quantities and procedures'.
- BS 8233: 1999 'Sound insulation and noise reduction for buildings – Code of Practice'.
- 'Guidelines for Community Noise' World Health Organisation. Geneva 1999.

3 Assessment Methodology & Assessment Criteria

3.1 Perception of Noise

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in pascals, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human auditory system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB L_A

Table 3.1 lists the sound pressure level in dB L_A for common situations.

Table 3.1: Noise Levels for Common Situations

Typical Noise Level, dB L_A	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, Refrigerator humming at 2m
50	Quiet office, no machinery, Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m, Vacuum cleaner at 3m
80	General factory noise level
90	Heavy goods vehicle from pavement, Powered lawnmower, operator's ear
100	Pneumatic drill at 5m
120	Discotheque - 1m in front of loudspeaker
140	Threshold of pain

All values are A-weighted sound pressure levels in dB re 2 x 10^{-5} Pa

The noise level at a measurement point is rarely steady, even in rural areas, and varies over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise level may vary over a range of 5 dB L_A, whereas in a suburban area this range may increase by up to 40 dB L_A or more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable occurrence. Furthermore, night-time noise levels are significantly reduced, by approximately 10 dB L_A, compared to daytime levels. For considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these transient variations.

The noise index $L_{A90,T}$ is widely used for assessing background noise level. This describes the noise level exceeded for 90% of the measurement period, T, and generally reflects the noise level in the lulls between individual noise events. Over a one hour measurement, the $L_{A90,1h}$ will be the noise level exceeded for a total of 54 minutes during that period.

The total noise or ambient noise at a location during a specific period is usually measured using the equivalent continuous A-weighted sound pressure level, L_{Aeq}, (as recommended by BS 7445). This is the single number that represents the sound energy measured over a given time period, T. $L_{Aeq,T}$ is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period, T. It is commonly used to express the energy level from individual sources that vary in level over an operational cycle.

The $L_{Amax,FAST,T}$ measurement parameter is the maximum instantaneous sound pressure level attained during the measurement period T, measured on the 'FAST' response setting of the sound level meter. It is generally used to assess the likelihood of night-time sleep disturbance.

In the UK the noise index traditionally used to assess the impacts of road traffic noise is the $L_{A10,18h}$. This is the arithmetic average of the 18 one hour noise indices $L_{A10,1h}$, i.e. the arithmetic average of the noise level exceeded for 10% of each hourly period from 06:00 to midnight. This noise index has been shown to provide a reasonable correlation with resident's disturbance from road traffic noise experienced in the homes.

Human subjects, under laboratory conditions, are generally capable of noticing changes in steady levels of about 1dB L_A or more. It is generally accepted that a change of 10 dB L_A in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient, non-steady or intermittent noise sources).

A summary of abbreviations is provided in Appendix A.

3.2 Significance Criteria

3.2.1 World Health Organisation Guidance

The World Health Organisation's (WHO) 'Guidelines for Community Noise' report for external daytime environmental noise levels (in a garden, for example) states that;

> 'During the daytime, few people are seriously annoyed by activities with L_{Aeq} levels below 55 dB; or moderately annoyed with L_{Aeq} levels below 50 dB.....'

For night-time noise sources the WHO guidelines provide a precautionary night-time (23.00-07.00) noise level of 45 dB $L_{Aeq,8hr}$ 'outside bedroom windows' (for a reasonably steady noise source). On a sleep disturbance basis (for intermittent or impulse noise) the guidelines state in Section 3.3 that:

> 'For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 dB L_{AFmax} more than 10-15 times per night……'

The WHO guidelines also converts the maximum internal noise level limit to an equivalent external façade noise level limit of 60 dB L_{Amax}, free field. This assumes that an open window of a typical dwelling will provide approximately 15 dB L_A reduction between internal and external noise levels. Consequently a noise level of 60 dB L_{Amax}, external to an open bedroom window would lead to a resulting internal level of approximately 45 dB L_{Amax}.

Recently, the World Health Organisation published the document 'Night Noise Guidelines for Europe', which recommends an aspirational night noise level of 40 dB $L_{night,outside}$ and an interim guideline value of 55 dB $L_{night,outside}$. The Night Noise Guidelines for Europe are complementary to the 1999 guidelines.

3.2.2 BS 8233:1999 Sound Insulation and Noise Reduction for Buildings – Code of Practice

This guidance sets out recommended internal noise levels for acceptable living and working conditions, as provided in Table 3.2 below.

Table 3.2: Recommended Internal Living and Working Noise Levels (BS 8233)

Criterion	Typical situations	Design range $L_{Aeq,T}$, dB	
		Good	Reasonable
Reasonable resting/sleeping conditions	Living rooms	30	40
	Bedrooms	30	35
Reasonable speech or telephone communications	Department store	50	55

Criterion	Typical situations	Design range $L_{Aeq,T}$, dB	
		Good	Reasonable
Reasonable conditions for study and work requiring concentration	Cellular office	40	50

Note: For Reasonable conditions for resting and sleeping at night the noise from individual noise events should not normally exceed 45 dB L_{AFmax} in bedrooms

Guidance is also provided for outdoor amenity spaces which include garden areas and balconies. It states that "*it is desirable that the steady noise level does not exceed 50 $L_{Aeq,T}$ dB and 55 $L_{Aeq,T}$ dB should be regarded as an upper limit*".

3.2.3 Sound Insulation

Providing a façade is traditionally constructed (i.e. predominantly masonry), windows are the main path for external noise to enter rooms.

The sound insulation of a window is usually measured over a wide range of frequencies from low to high in accordance with BS EN ISO 140-3: 1995, but it is more convenient to represent the insulation by a single figure. Traditionally in the UK, three single figure indices are used:

- R_m the mean reduction, is the arithmetic average across the noise spectrum, not commonly used,
- R_w, the weighted reduction, more useful, as it incorporates a correction for the response of the human ear,
- R_{TRA}, the weighted reduction against typical low speed urban road traffic noise.

BS EN ISO 717-1: 1997 '*Acoustics - Rating of sound insulation in buildings and building elements Part 1*' introduced the term C_{tr}, the A-weighted noise spectrum adaptation term for urban traffic noise and low speed rail traffic.

C_{tr} is usually a negative number so R_w+C_{tr} will be less than R_w on its own. For urban situations R_w+C_{tr} is now the most commonly used acoustic specification for facades in the UK as it provides an estimate of the A-weighted noise reduction with reference to road traffic noise.

3.2.4 Fixed Plant Noise

The impact of noise of an industrial nature can be assessed using the BS 4142 '*Method for rating industrial noise affecting mixed residential and industrial areas*'. This standard sets down the following guidelines for assessing the likelihood of complaints based upon the difference between the measured 'background noise level' (L_{A90}) and the 'rating level' of the source under consideration, as shown in Table 3.3 below:

Table 3.3: BS 4142 Assessment Criteria

Difference between Rating Noise Level & Background Noise Level	Likelihood of Complaints
Greater than +10 dB	Likely
+5 dB	Marginal significance
More than 10 dB below	Unlikely

The principal terms used in BS 4142 are broadly defined as follows:

1 Specific noise level – The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.

2 Rating level – Specific noise level corrected to allow for certain distinctive acoustic features.

3 Residual noise level – The ambient noise level remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

4 Background noise level – The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using time weighting, F, and quoted to the nearest whole number.

The standard states that the appropriate reference time interval for assessment of noise during the daytime and night-time is 1 hour and 5 minutes respectively.

Background noise typically varies throughout the day and night. For plant that may operate on a 24-hour basis, it is appropriate to measure the representative lowest background noise level (which would normally occur in the early hours of the morning) at the nearest residential properties and to use this value for comparison against the predicted specific noise level or rating level from the new plant and activities. If it can be shown that the rating level from the proposed new fixed plant is not likely to give rise to complaints for the quietest period of the night, then it follows that the noise impact will be lower at all other times throughout a 24-hour period. This is with the exception where plant and activities in operation change throughout the day and night.

It should be noted that BS 4142 is not suitable for use where both the background noise level and the rating level are very low. For the purpose of the standard, background noise levels below about 30 dB $L_{A90,T}$ and rating levels below about 35 dB $L_{Ar,Tr}$ are considered to be very low.

When both the rating and background noise levels are measured or predicted to be very low it is general practice to revert to the guidance contained in BS 8233: 1999 where design targets for indoor ambient noise are provided.

3.2.5 Road Traffic Noise

Road traffic noise impacts due to the development may arise due to changes in traffic flow and composition on the existing road network serving and surrounding the development.

Noise from a flow of road traffic is generated by vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (% Heavy Goods Vehicles, HGV), road gradient, type of road surface, distance from the road and the presence of any screening factors between the road and the receptor.

Noise from a stream of traffic is not constant and therefore to assess the noise impact it is necessary to derive a single figure estimate of the overall noise level. The index adopted by the Government in 'Calculation of Road Traffic Noise' (CRTN 1988, first issued in 1975) to assess traffic noise is $L_{A10,18h}$, which is the arithmetic mean of the noise levels exceeded for 10% of the time in each of the eighteen 1-hour periods between 06:00 and 24:00. A reasonably good correlation has been shown to exist between this index and residents' disturbance in their homes over a wide range of exposure to road traffic noise. The traffic forecast data used for the noise predictions are presented in Appendix B. The most likely traffic forecasts have been used for the prediction of road traffic noise.

A change in road traffic noise of 1 dB L_A in the short term (e.g. in the opening year of a scheme) is the smallest that is considered perceptible. In the long term, a 3 dB L_A change is considered the minimum perceptible. The magnitude of impact should therefore, be considered differently in the short and long term.

The classification of magnitude of impacts to be used for traffic noise as stated in DMRB HD 213/11 are shown in Table 3.4 (Short term) and Table 3.5 (Long term).

Table 3.4: Classification of Magnitude of Noise Impacts in the Short Term

Noise Change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

Table 3.5: Classification of Magnitude of Noise Impacts in the Long Term

Noise Change, $L_{A10,18h}$	Magnitude of Impact
0	No change
0.1 – 2.9	Negligible
3 – 4.9	Minor
5 – 9.9	Moderate
10+	Major

It should be noted that a 25% increase or 20% decrease in traffic flow, if speed and other factors remain unaltered, results in a 1dB(A) change in road traffic noise.

3.3 Liaison with High Peak Council

The Environmental Health Team at High Peak Council has been consulted as part of this assessment and were in agreement with the proposed noise monitoring locations. In terms of assessment criteria, they have confirmed:

- The internal noise levels should achieve levels with the WHO Guidelines for Community Noise and BS8233:1999 and achieve 35 dB $L_{Aeq,16hour}$ in living rooms and 30 dB $L_{Aeq,8hour}$ in bedrooms;
- The external noise levels in outdoor living areas should not exceed 50 dB $L_{Aeq,16hour}$;
- The Rating Level of commercial/ community noise (e.g. fixed plant items) should not exceed the existing background noise level in the residential development envelope when assessed in accordance with BS 4142.

4 Noise Monitoring

4.1 Site Location

The site is located on land between Ashbourne Road and Harpur Hill Road to the south of Buxton, Derbyshire. It is bounded to the north by residential properties on Clifton Drive, Hastings Road and Dorset Close. Land to the south of the site is predominantly green field although there are some residential properties which border the site at the south-west boundary. Staden Lane industrial estate lies to the north-east of the proposed site on the opposite side of Ashbourne Road.

Baseline environmental noise surveys have been undertaken to characterise and quantify the existing baseline noise levels within the development area. The noise surveys were undertaken on the 5th and 6th June 2013.

4.2 Measurement Parameters

Attended measurements were undertaken during the survey using a fully calibrated Norsonic 116 Sound Level Meter (SLM) (s/n 19697). The SLM is subject to a valid traceable calibration. Field calibration was undertaken using a Norsonic 1251 (s/n 27485) portable calibrator. In addition to the attended measurements, an unattended noise logger was left at the site over a 24 hour period. The logger consisted of a Norsonic 118 SLM (31509) and GRAS 41AL Environmental Microphone (s/n 55090). Both pieces of equipment hold a valid traceable calibration and were checked in the field using the Norsonic 1251 sound calibrator prior to and on completion of the monitoring period.

Measurement practice was undertaken in accordance with the principles of the relevant British and International Standards.

A-weighted noise indices were recorded: the equivalent continuous noise index, $L_{Aeq,T}$, statistical noise indices used to assess noise from road traffic, $L_{A10,T}$, and background noise, $L_{A90,T}$. The sound level meters were set to the 'FAST' time response. The calibration of the equipment was checked before and after each set of measurements. No drift in calibration was noted

4.3 Monitoring Locations

Noise monitoring equipment was set up at a height of approximately 1.5 m above ground level at each measurement location unless otherwise stated. A list of the measurement locations is presented in Table 4.1 and displayed on a map in Appendix B. These were chosen to provide an indication of noise levels at representative locations around the proposed development. The microphone position at all monitoring locations was in free-field conditions.

Table 4.1: Noise Monitoring Locations

Position	Location	Comments	Measurement Type
1	Hastings Road 406503, 371716	The measurement position was located towards the north-western boundary of the site to the rear of existing houses on Hastings Road. Ashbourne Road not visible from this location.	Attended
2	Ashbourne Road 406785, 371782	The measurement position was located towards the north-eastern boundary of the site along Ashbourne Road. The measurement location was approximately 15 m from Ashbourne Road	Attended
3	SE Boundary 406834, 371525	The measurement position was located along the south-eastern boundary of the site. The measurement location was approximately 175 m from Ashbourne Road	Attended
4	Centre of Site 406593, 371567	The measurement position was approximately in the centre of the proposed development site, near to the existing farm buildings. Ashbourne Road was visible from this location, approximately 310 m away.	Attended
5	Harpur Hill Road 406357, 371376	Western boundary of site, near to Harpur Hill Road. Measurement location approximately 40 m from Harpur Hill Road.	Attended
L	Ashbourne Road Logger 406748,371774	The measurement position was located towards the north-eastern boundary of the site along Ashbourne Road. The measurement location was approximately 50 m from the edge of Ashbourne Road	Unattended

4.4 Meteorological Conditions

During the noise monitoring on 5th June, conditions were cloudy with a light breeze and temperatures ranging between 10 - 13˚C. On the 6th June, conditions were cloudy to begin which cleared to sunny skies with an occasional light breeze. Temperatures were between 13 - 17˚C. No rain fell throughout the measurement periods. These conditions are considered conducive for noise monitoring.

4.5 Noise Sources

4.5.1 Location 1: Hastings Road (day-time only)

The dominant noise source at this location during the measurement period was traffic using Ashbourne Road. This was predominantly cars although there were also a high number of HGVS. Reversing alarms from vehicles on the Staden Lane industrial estate were occasionally just audible at this location. Other sources of noise noted at this location were aircraft over flights, occasional traffic on Hastings Road and noise from domestic activities at properties on Hastings Road.

4.5.2 Location 2 – Ashbourne Road

The dominant noise source at this location during the day-time measurement period was traffic using Ashbourne Road. This was predominantly cars although there were also a high number of HGVS. Other noise sources audible at this location during the day-time were reversing alarms from vehicles on the Staden Lane industrial estate, aircraft flying overhead, occasional bangs from loading / unloading activities at the industrial estate. During the night-time, noise from vehicle traffic on Ashbourne Road caused the highest noise levels to be recorded, although traffic was only intermittent. During periods of no traffic, noise from the Staden Lane industrial estate was audible, thought to be ventilation plant serving one of the buildings. This was not considered to be tonal in nature.

4.5.3 Location 3 – SE Site Boundary (day-time only)

The dominant noise source at this location during the measurement period was traffic using Ashbourne Road. This was predominantly cars although there were also a high number of HGVS. Reversing alarms from vehicles on the Staden Lane industrial estate were occasionally just audible at this location. Other sources of noise noted at this location were aircraft over head and birdsong.

4.5.4 Location 4 - Centre of Site (day-time only)

The dominant noise source at this location during the measurement period was traffic using Ashbourne Road. This was predominantly cars although there were also a high number of HGVS. Reversing alarms from vehicles on the Staden Lane industrial estate were occasionally just audible at this location. Other sources of noise noted at this location were aircraft over head and birdsong. During the measurement on 6th June, crop-spraying was taking place in a nearby field which appears to have slightly increased the noise levels recorded.

4.5.5 Location 5 - Harpur Hill Road

This location was generally quiet during both the day and night-time. The dominant source of noise was vehicle traffic on Harpur Hill Road, although levels of traffic were relatively low, particularly during the night-time period. Occasional distant aircraft over head flights were occasionally audible. Noise from the Staden Lane industrial estate was not audible at this location.

4.5.6 Location L - Unattended Logger (Ashbourne Road)

As Location 2.

4.6 Results

The results from daytime and night-time noise measurements, taken during the noise monitoring period from 5th and 6th June 2013 are summarised in Tables 4.2, 4.3 and 4.4.

Table 4.2: Daytime Noise Monitoring Results

Position	Date	Start Time	Duration (mins)	$L_{Aeq,T}$ (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{Amax} (dB)
1	5th June 2013	09:19	50*	42	44	38	60
	6th June 2013	11:33	60	41	43	36	62
2	5th June 2013	10:10	60	60	63	53	71
	6th June 2013	12:42	60	62	63	53	86
3	5th June 2013	11:19	60	54	56	49	65
	6th June 2013	13:50	15*	51	54	47	61
	6th June 2013	14:06	45	52	55	48	64
4	5th June 2013	12:29	60	47	49	44	66
	6th June 2013	14:57	60	50	51	45	71
5	5th June 2013	13:39	60	46	48	40	65
	6th June 2013	16:09	60	49	50	42	71

* Measurement curtailed due to battery failure
All values are A-weighted sound pressure levels in dB re 20 µPa

Table 4.3: Night-time Noise Monitoring Results

Position	Date	Start Time	Duration (mins)	$L_{Aeq,T}$ (dB)	L_{A10} (dB)	L_{A90} (dB)	L_{Amax} (dB)
2	6th June 2013	00:39	5	48	51	37	66
		00:44	5	46	45	36	67
		00:49*	5	37	39	36	41
		00:54	5	51	55	37	65
		00:59	5	48	41	37	68
		01:04	5	45	43	37	63
5	6th June 2013	01:18	5	31	33	28	53
		01:23	5	30	32	28	39
		01:28	5	30	32	27	41
		01:33	5	31	32	28	48
		01:38	5	34	33	28	50
		01:44	5	31	32	28	38
		01:49	5	32	31	27	52

*No cars passed along Ashbourne Road during this period
All values are A-weighted sound pressure levels in dB re 20 µPa

Table 4.4: Summary of Logger Results

Period	Average Level	Maximum Level
Day-time (07:00 – 23:00)	55 dB $L_{Aeq,16hr}$	79 dB L_{AFmax}
Night-time (23:00 – 07:00)	52 dB $L_{Aeq,8hr}$	72 dB L_{AFmax}

All values are A-weighted sound pressure levels in dB re 20 µPa

The full data from the unattended noise logger are included at Appendix C.

4.7 Survey Results Commentary

The baseline noise survey provides data on the existing levels of noise levels and sources in the vicinity of the development site.

Generally the site was considered to be relatively quiet, with vehicle traffic on Ashbourne Road being the dominant source of noise impacting upon the majority of the development site. During the night-time, levels of vehicle traffic were reduced along Ashbourne Road, with significant periods of time when there were no vehicles travelling this road. At these times, noise from

ventilation plant associated with units on Staden Lane Industrial estate was audible at Location 2, although this was at a low level, with a level of 37 dB $L_{Aeq,5min}$ recorded for a period when no vehicles travelled along Ashbourne Road.

The Staden Lane industrial estate incorporates Buxton Fire Station. Whilst there was no noise directly attributable to the Fire Station building, it was noted during the survey that Fire Engines departing the Fire Station travelled a short distance along Ashbourne Road with sirens on. This was only observed on two occasions during the entire monitoring period and resulted in a maximum noise level of 86 dB L_{AFmax} being recorded at Location 2 adjacent to Ashbourne Road.

The measured noise levels in the surrounding areas of the proposed site are considered representative of the surrounding environment.

4.8 Existing Ambient Vibration Monitoring

There are currently no significant sources of vibration in the area. Consequently, ambient vibration monitoring has not been undertaken. It should be noted that annoyance due to vibration is not related to the comparison of pre and post-development vibration levels, and pre-development vibration levels are not usually necessary to assess the likelihood of vibration damage or annoyance from any new vibration sources likely to be introduced into the area.

5 Noise Assessment

5.1 Introduction

The proposed development has the potential to generate noise and vibration from the following principal activities:

- Changes in road traffic flows on existing roads once the proposed development has been constructed.
- Noise from new items of fixed plant.
- Noise from proposed commercial/ community facilities affecting existing and proposed NSRs.

There are also a number of noise sources which may have noise impacts upon the proposed development which include:

- Noise from Staden Lane Industrial Estate; and
- Road traffic noise from the roads in the vicinity of the development.

5.2 Road Traffic Noise

The impact due to change in noise levels as a result of the increase in road traffic due to the proposed development has been assessed using guidance in Tables 3.4 and 3.5.

Basic noise levels (BNL) have been calculated to predict the change in road traffic noise levels on Ashbourne Road. These calculations have been performed in accordance with the Department of Transport publication 'Calculation of Road Traffic Noise'.

AAWT traffic flows were provided by the AECOM transportation for Ashbourne Road in vicinity of the proposed site for the base year (2013), and the 'with' (Do-Something) and 'without' (Do-Minimum) scenarios for the opening year (2015) and future year (2020). All the 'with' development traffic flows are based on additional traffic volumes from traffic generated by the proposed site. It has been assumed that there is no change in speed and percentage of HGVs. The predicted BNLs, percentage change and magnitude of impact of the opening and future year are shown in Tables 5.1 and 5.2.

Table 5.1 Basic Noise Levels for main roads surrounding the proposed site- Short Term Impacts

Road	BNL in dB(A)			BNL % Change (2015 DS – 2015 DM)	Magnitude of Impact
	2015 DM	2015 DS	Change		
Ashbourne Road	69.3	69.4	0.6	14.9	Negligible

Table 5.2 Basic Noise Levels for main roads surrounding the proposed site- Long Term Impacts

Road	BNL in dB(A)			BNL % Change (2020 DS – 2015 DM)	Magnitude of Impact
	2015 DM	2020DS	Change		
Ashbourne Road	69.3	70.0	0.7	17.3	Negligible

When considering two sounds with similar acoustic properties, i.e. similar spectral and temporal characteristics, a change of more than 3 dB L_A is regarded as being just perceptible to the human ear. It is generally accepted that changes in road traffic noise levels of up to 3 dB are not widely perceptible, confirmed in the Department for Transport document Transport Appraisal Guidance Unit 3.3.2 (Department for Transport, 2007):

> *"For freely flowing traffic, a difference of about 3dB in noise level is required before there is a statistically significant change in the average assessment of nuisance. The assessment of nuisance however could still be affected even if there is only a 1dB change in the noise level if the change is associated with changes in the view of traffic, or if the change occurs suddenly."*

In the short and long term, the additional traffic along Ashbourne Road due the development will have a negligible impact on existing and future noise sensitive receptors.

5.3 Employment / Commercial Units

Details of the proposed fixed plant to be installed at Employment and Commercial Units at the development are currently not available and may be tenant dependent; therefore it has not been possible to assess the noise impacts of specific items of building services plant.

As stated by High Peak Council, any new fixed mechanical plant in operation as a part of the redevelopment should operate at a Rating Level that is no higher than the existing background noise level (L_{A90}) at the nearest existing or new NSR. Noise measurements at Locations 2 and 3 are considered representative of the background noise levels at the proposed NSRs, with the lowest background noise level being in the night time period of 36 L_{A90} dB.

Therefore it is recommended that plant is designed and located to achieve a combined Rating Level of no higher than 36 dB to ensure plant noise, when running continuously during the daytime and night-time, will unlikely to cause complaints according to BS 4142.

Accordingly, it is proposed that all fixed plant will be chosen, or noise mitigation measures provided, such that High Peak Council criterion is met. The extent of any noise mitigation measures can be determined at the detailed design stage.

At this stage the end use of the employment/commercial units are not known. BS 8233 recommends levels in offices and work spaces, a summary of which is provided in Table 3.2. Currently the precise layout of each building is not known. The level of acoustic attenuation provided by the building envelope is strongly dependant on the type of construction, predominantly masonry, glass curtain walling etc., which for commercial buildings can vary widely. Consequently it is recommended as the detailed design is developed that consideration is given to the required acoustic attenuation and further assessments undertaken to demonstrate that the required level of acoustic performance can be provided.

In addition to noise from fixed plant considered above, the employment/ commercial premises have the potential to cause noise disturbance to the nearby proposed residential dwellings/ residential care/ retirement homes, in a number of ways, as follows:

- from customers arriving at and leaving the commercial premises;
- from vehicles and parking activities; and
- from delivery activities associated with the commercial premises.

Noise control measures will be required to ensure that there is no noise disturbance to adjacent residential dwellings from any of these, and mitigation measures are discussed in Section 6.

5.4 Residential Development Assessment

Measurement of existing ambient noise levels in the vicinity of the site suggests that the boundaries of the residential areas of the site with Ashbourne Road are around 55 dB $L_{Aeq,16hr}$ during the daytime and potentially within 52 dB $L_{Aeq,8hr}$ at night. At other locations further away from Ashbourne Road, the noise levels decreased accordingly, with levels of $L_{Aeq,1hour}$ = 46 dB and $L_{Aeq,30mins}$ = 31 dB recorded towards the boundary with Harpur Hill Road during the day and night-time respectively. It is expected that once the development is complete, properties on the boundary with Ashbourne Road will provide effective screening to properties towards the centre of the development and so the noise levels experienced at these locations may be lower than reported here.

During the night-time, noise levels were again highest towards the boundary with Ashbourne Road, with the recorded levels ranging between L_{Aeq} = 37 – 51 dB, dependent on the levels of traffic along Ashbourne Road. During periods when no vehicles were travelling on Ashbourne Road, some noise of ventilation plant at the Staden Lane industrial estate was audible at this site boundary with Ashbourne Road, although a level of L_{Aeq} = 37 dB was recorded for a 5 minute period when no vehicles travelled along Ashbourne Road, and so the overall levels of noise from the industrial estate are considered to be low.

At the west of the site, the noise levels are very low, ranging between L_{Aeq} = 30 – 34 dB, as a result of very low levels of vehicle traffic on Harpur Hill Road.

For residential properties along the boundary with Ashbourne Road, it is expected that mitigation measures will be required to achieve the internal noise level criteria in bedrooms & living rooms and also the criteria for noise levels in external living areas. Potential Mitigation measures are discussed in Section 6 of this report.

At distances set further back from the existing (and proposed) roads, and once buildings have been constructed on-site that will provide screening of road traffic noise sources, noise levels at other parts of the development should be further reduced, and it is considered that specific noise mitigation measures will be unlikely to be required

At all locations it should be possible to address internal and external noise levels for future residents by specifying appropriate noise reduction measures such as the orientation of the buildings, erection of acoustic barriers/fences to reduce noise in gardens/amenity spaces and, for internal spaces, the installation of appropriate glazing, and ventilation where necessary. Potential mitigation measures are discussed further below.

6 Mitigation

6.1 Operational

6.1.1 Proposed Residential Properties.

The existing noise levels measured at the proposed development site indicate that appropriate façade/glazing/ventilation specifications are required to meet the internal noise level criteria specified by High Peak Council for properties proposed near to the boundary with Ashbourne Road.

The sound reduction offered by a window is usually measured over a wide range of frequencies in accordance with BS EN ISO 140-3: 1995. The sound reduction performance is then often represented by a single number.

The effectiveness of glazing/ ventilation mitigation can be generally categorised into three different groups. Thermal double glazing is typically used in modern residential developments and this type of sealed unit double glazed window provides sound insulation (R_w+C_{tr}) of approximately 30 dB) from PPG24. However, when a window is partially opened, it will typically provide 10 to 15 dB of noise attenuation.

To achieve an R_w+C_{tr} of greater than 30 dB, acoustic double glazing would need to be employed along with acoustic ventilation which performs to an acoustic standard that is at least as good as the acoustic glazing.

The different levels of noise mitigation provided by different glazing and ventilation configurations are summarised in Table 6.1.

Table 6.1: Acoustic Attenuation from Glazing & Ventilation Configurations

Mitigation Configuration	Noise Attenuation Provided
Partially Open Window	10 - 15 dB
Standard Thermal Glazing with Ventilation	Up to approximately 30 dB, although products of variable performance are available.
Acoustic Glazing and Ventilation	>30 dB

The type of acoustic ventilation installed in residential properties should be determined by what is practicable for individual buildings so ventilation could consist of different unit types (e.g. in-frame or in-wall passive or trickle,) in different properties. Ventilation units should be capable of providing the same acoustic insulation performance as the glazing.

The noise levels measured during the day-time period across the proposed residential area ranged from 62 dB L_{Aeq} to 41 dB L_{Aeq}, with noise levels decreasing with the increased distance from Ashbourne Road and so in some areas of the site, mitigation measures may be required to achieve noise levels no greater than 50 dB L_{Aeq} in outdoor living areas.

The noise levels vary across the site, with the highest noise levels experienced at locations close to Ashbourne Road, due to the levels of vehicle traffic along here. As it is only at outline planning stage, the precise locations, layout and orientation of any residential properties that may be built is not yet finalised, and so it is not possible to undertake detailed calculations for the sound insulation performance requirements for individual dwellings.

As the noise levels vary across the site, the strategies for controlling noise ingress to residential properties will depend on location. For dwellings towards the Harpur Hill Road boundary, it is likely that ventilation via partially openable windows will achieve the required internal noise levels. For dwellings on the north-west and south-eastern boundaries of the site, as well as those in the centre of the site may require standard double glazing and trickle ventilation to achieve the internal noise level criteria.

The properties that are most exposed to noise will be those on the boundary with Ashbourne Road. For these properties, acoustic glazing and trickle ventilation may be required to achieve the internal noise criteria. Other mitigation measures could also be adopted in addition to this, such as arranging the internal room layouts so that bedrooms face away from Ashbourne Road.

It is recommended that the detailed specification of appropriate façade glazing/ventilation requirements to meet internal noise level criteria be determined at the detailed design stage, when the location and design details of properties will be finalised. Detailed glazing specification should take into account the size of proposed windows, facade construction, internal room sizes, reverberation, all of which will affect glazing recommendations and resultant internal noise levels. The actual glazed facade area for individual rooms will also affect the recommended glazing requirements, therefore where smaller windows are proposed, a lower specification of glazing may be adequate.

With respect to gardens any external living areas that are located along the boundary with Ashbourne Road, mitigation measures will be required to achieve the day-time criterion of 50 dB L_{Aeq}. The day-time noise level recorded by the unattended logger towards the boundary with Ashbourne Road was $L_{Aeq,16h}$ = 55 dB and so only a moderate reduction is likely to be required to achieve a level of L_{Aeq} = 50 dB in external living areas, and likely to be achievable with screens or fences between the external living areas and Ashbourne Road. The extent of noise mitigation will be influenced by the final site layout design and therefore the location and height of any acoustic screening (barriers/bunds) can be determined at the detailed design stage.

For external living areas towards the centre of the site, the noise levels experienced at these locations are lower and are likely to be reduced further by proposed houses at the edge of the development providing effective screening of road traffic noise from Ashbourne Road. In order to maximise this screening effect, it is recommended that gaps between buildings is minimised, or takes the form of a continuous row of properties of contiguous overlapping blocks that effectively create a (semi) contiguous acoustic screen. In addition, the buildings toward the ends of development blocks can be returned in to the site so as to provide acoustic screening to the sides and interior of the development.

It is expected that noise levels in external living areas towards the west of the development (Harpur Hill Road) will be below L_{Aeq} = 50 dB without the need for any specific mitigation measures.

6.1.2 Employment / Commercial Units

By careful design and specification at the detailed design stage, it should be possible to achieve the recommended noise limits, where necessary by accommodating appropriate noise attenuation measures. For example, breakout noise from refrigeration plant contained within plant rooms can be reduced using acoustic ventilation louvres, noise from fans housed within ducted intakes and exhausts can be reduced using in-duct attenuators and noise from boiler flue fans can be reduced by atmospheric-side boiler flue attenuators. Hence, the appropriate design, location and installation of any fixed plant, and associated mitigation where necessary, such that High Peak Council's fixed plant noise criteria are met, should ensure that significant adverse impacts should not arise.

Regarding noise from any deliveries associated with the proposed new development, at this stage the type of businesses that will occupy the commercial units and therefore the specific requirements for deliveries are not yet known. However, in order to limit the likelihood of noise disturbance, it is common practice for the Planning Authority to restrict the hours of operation of the premises and also specify acceptable hours for delivery associated with these businesses. It is also recommended that an electric hook up is provided for refrigerated delivery vehicles and that engines are turned off during unloading.

7 Summary & Conclusions

A noise and vibration assessment has been undertaken in order to assess the potential impact of the existing and anticipated future noise climate on the proposed Foxlow Farm development

Baseline noise monitoring was undertaken to establish the existing ambient levels and significant sources in the vicinity of the proposed development.

Based on the noise levels measured at the proposed development site, the impact on the proposed residential accommodation has been assessed along with the likelihood of achieving the requirements of the Local Authority in relation to noise. Where mitigation measures are likely to be necessary to achieve these requirements, this has been highlighted.

At this stage there is limited information available about the proposed development site in terms of numbers, locations, heights and orientations of specific residential properties and so it is only possible to highlight outline mitigation measures likely to be necessary. Specific mitigation measures would be developed during the detailed design of the site to ensure the requirements of the Local Authority are met. It is considered that no exceptionally high performance, unusual, or potentially impractical noise mitigation measures would be required.

The proposed development will result in a slight increase in traffic along Ashbourne Road; however the impact from the increased traffic on existing and future noise sensitive developments is predicted to be negligible in the short and long term.

Appendix A: Glossary of Acoustic Terminology

Noise	Unwanted sound.
Frequency (Hz)	The number of cycles per second (i.e., the number of vibrations that occur in one second); subjectively this is perceived as pitch.
Frequency Spectrum	The relative frequency contributions that make up a noise.
dB L_A	Instead, the dB L_A figure is used, as this is found to relate better to the loudness of the sound heard. The dB L_A figure is obtained by subtracting an appropriate correction, which represents the variation in the ear's ability to hear different frequencies, from the individual octave or third octave band values, before summing them logarithmically. As a result the single dB L_A value provides a good representation of how loud a sound is.
$L_{eq,T}$	The equivalent continuous sound level. It is the steady sound level which would produce the same energy over a given time period T as a specified time varying sound.
L_{Amax}	The L_{Amax} is the loudest instantaneous noise level. This is usually the loudest 125 milliseconds measured during any given period of time.
*L*n	Another method of describing, with a single value, a noise level which varies over a given time period is, instead of considering the average amount of acoustic energy, to consider the length of time for which a particular noise level is exceeded. If a level of x dB L_A is exceeded for say. 6 minutes within one hour, then that level can be described as being exceeded for 10% of the total measurement period. This is denoted as the $L_{A10,1h}$ = x dB. The L_{A10} index is often used in the description of road traffic noise, whilst the L_{A90}, the noise level exceeded for 90% of the measurement period, is the usual descriptor for underlying background noise. L_{A1} and L_{Amax} are common descriptors of construction noise.
Ambient Noise Level, $L_{Aeq,T}$	The equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time that is usually composed of sound from many source near and far.
Background Noise Level $L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of a given time interval, T, measured using the fast time weighting, F, and quoted to the nearest whole number.
Reference Time Interval, *Tr*	The specified interval over which an equivalent continuous A-weighted sound pressure level is determined.
Specific Noise Level, $L_{Aeq,Tr}$	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
Rating Level, $L_{Ar,Tr}$	The specific noise level plus any adjustment for any characteristic features of the noise.

Level $L_{A10,T}$

The A-weighted sound pressure level exceeded for 10% of a given time interval, T, measured using the fast time weighting, F.

BNL

Basic Noise Level-The BNL is the noise level due to road traffic predicted at 10 metres from the nearside carriageway according to the following equation:

$$L_{10}(18\ hour) = 29.1 + 10logQ + 33\log\left(V + 40 + \frac{500}{V}\right) + 10\log(1 + \frac{5p}{V}) - 68.8$$

Where Q is the 18 hour AAWT, V is the traffic speed, and p is the percentage of HGVs.

CRTN

Calculation of Road Traffic Noise

NPPF

National Planning Policy Framework

PPG24

Planning Policy Guidance 24 Planning and Noise

SLM

Sound Level Meter

Appendix B: Noise Monitoring Locations

Key

- Redline Boundary 22.3ha
- Land in Ownership
- Fox Low Informal Community Park 19.5ha
- A Main Access from Ashbourne Road
- B Residential Development 13.4ha
- C Existing Properties Retained
- D Local Center/ Employment/ Commercial 2ha
- E Main Vehicular Street
- F Existing Public Right of Way
- G Footpath Links
- H Proposed Public Open Space 6.9ha
- I Proposed Allotments
- J Proposed Bowls Green
- K Proposed Informal Sports Pitch
- L Proposed Structural Landscaping
- M Proposed Structural Mounding
- N Wall and Existing Boundary Vegetation Retained
- O Gateway Roundabout
- P Agricultural Land Retained
- Q Existing Structural Landscaping
- R Existing Covered Reservoir
- S Scheduled Monument
- T Access to Parkland
- U Proposed Retirement Living

N

Appendix C: Unattended Logger Data

Time	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{AF10} (dB)	L_{AF90} (dB)
09:00	57	64	61	52
09:15	57	66	60	51
09:30	57	64	60	51
09:44	58	66	61	50
10:00	57	78	60	52
10:14	58	66	60	52
10:30	58	65	61	52
10:45	58	67	61	53
11:00	58	68	60	52
11:15	57	64	59	52
11:30	57	64	60	52
11:45	57	66	60	51
12:00	58	72	60	53
12:15	57	67	60	53
12:30	57	64	60	52
12:45	57	68	60	53
13:00	57	69	60	53
13:15	58	66	60	53
13:30	57	67	60	51
13:45	57	66	59	52
14:00	58	68	60	53
14:15	56	65	59	51
14:30	57	68	59	52
14:45	57	66	59	52
15:00	57	68	60	52
15:15	57	68	60	51
15:30	58	67	61	53
15:45	58	69	61	52
16:00	58	68	60	54
16:15	58	66	61	54
16:30	58	67	60	54
16:45	58	70	60	53
17:00	58	66	61	54
17:15	59	67	61	55
17:29	58	68	60	53
17:45	57	64	60	53
18:00	58	79	60	51
18:15	57	64	60	49
18:30	56	64	59	48
18:45	56	68	59	50

All values are free-field sound pressure levels re 20 μPa

Table C.1: Unattended Logger Noise Levels
5th June 2013

Time	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{AF10} (dB)	L_{AF90} (dB)
19:00	57	65	60	50
19:15	57	72	59	50
19:30	55	67	59	44
19:45	55	65	59	45
20:00	55	66	58	43
20:15	54	64	58	42
20:30	55	66	59	44
20:45	55	69	58	43
21:00	54	64	58	43
21:15	55	68	58	43
21:30	54	64	58	43
21:45	54	65	58	43
21:59	55	72	57	42
22:15	56	79	56	42
22:30	51	67	55	39
22:45	48	62	52	38
23:00	47	64	52	37
23:15	50	64	54	38
23:30	48	67	53	38
23:45	47	60	52	37
00:00	46	63	48	37
00:15	50	67	53	37
00:30	47	62	50	37
00:44	45	62	42	37
01:00	45	64	47	37
01:15	42	60	41	37
01:30	42	59	41	38
01:45	43	58	43	38
02:00	45	64	46	38
02:15	43	57	43	38
02:30	47	65	49	37
02:45	46	65	48	37
02:59	40	57	40	36
03:14	48	65	51	37
03:30	45	61	48	37
03:45	46	65	45	38
04:00	49	66	52	38
04:15	48	67	50	38
04:30	51	65	56	39
04:45	53	67	57	39

All values are free-field sound pressure levels re 20 μPa

Table C.2: Unattended Logger Noise Levels
5th – 6th June 2013

Time	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{AF10} (dB)	L_{AF90} (dB)
05:00	54	67	59	41
05:15	54	67	58	42
05:30	56	70	60	45
05:45	56	72	60	44
06:00	57	71	61	43
06:15	56	68	60	43
06:30	58	68	61	45
06:45	57	70	61	47
07:00	59	72	62	51
07:15	60	69	62	54
07:30	59	69	62	53
07:45	59	71	62	52
08:00	59	73	62	52
08:15	59	75	61	54
08:30	58	70	61	53
08:45	58	67	61	52
09:00	58	66	61	52
09:15	58	71	61	51
09:30	58	66	61	53
09:45	58	66	60	52
10:00	58	67	61	52
10:15	58	68	61	51
10:30	58	66	61	52
10:45	58	67	61	54
11:00	57	68	60	53
11:15	57	65	60	50
11:30	57	73	60	51
11:45	57	69	59	50
12:00	57	69	60	52
12:15	57	67	60	53
12:30	57	66	60	52
12:44	57	70	60	52
13:00	57	71	60	51
13:15	63	87	61	52
13:29	56	65	59	51
13:45	56	65	59	51
13:59	57	67	59	52
14:14	56	67	59	51
14:29	57	66	60	53
14:44	56	65	59	50

All values are free-field sound pressure levels re 20 μPa

Table C.3: Unattended Logger Noise Levels
6th June 2013

Time	L_{Aeq} (dB)	L_{AFmax} (dB)	L_{AF10} (dB)	L_{AF90} (dB)
15:00	57	68	60	52
15:15	57	65	60	53
15:30	57	65	60	52
15:45	61	80	62	54
16:00	60	77	62	52
16:15	58	76	60	53
16:30	61	77	62	55
16:45	58	66	60	54
17:00	59	68	61	55
17:15	59	81	60	51
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
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-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-

All values are free-field sound pressure levels re 20 μPa

Table C.4: Unattended Logger Noise Levels
6th June 2013