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## INTRODUCTION

- 8.1 An assessment of noise has been carried out with reference to British Standard and other government guidance. Noise issues relating to the construction and operation of the proposed aggregate recycling facility have been considered at the nearest noise-sensitive receptors surrounding the site.
- 8.2 Technical terms or references are occasionally used in this section. To assist the reader, a glossary of terminology, including a table of example noise levels that may be found in general life, are included in Appendix 8/A.

## Government Advice, Standards and Good Practice

### *Consultation with Local Authority*

- 8.3 Hampshire County Council were consulted to confirm their views and policies on noise-related issues for the local area around the proposed development site and during email correspondence with the Environmental Health Officer the following survey and assessment methodologies were agreed;
- Environmental noise surveys would be carried out at the nearest residential and environmental noise sensitive locations to the site to cover the proposed operational hours of the new facility; namely 07:30 to 18:00 Monday to Friday and 07:30 to 13:00 on a Saturday;
  - The noise and vibration levels generated by the construction of the propose earth bund at the site would be calculated and assessed using the guidance contained in BS5228:2009 *Code of practice for noise and vibration control on construction and open sites – Part 1: Noise and Part 2: Vibration*;
  - The noise levels generated by construction and operational traffic movements would be predicted using the haul route method contained in BS5228-1:2009 and assessed against the existing ambient noise levels in the area using the impact scale outlined in the *Draft Guidelines for Noise Impact Assessment* produced by the Institute of Acoustics and Institute of Environmental Management and Assessment Working Party;
  - The noise levels generated by the operation of the new equipment associated with the aggregates recycling facility would firstly be predicted at the nearest residential receptors and assessed against the measured background noise levels accordance with the guidance contained in British Standard 4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas*;
  - The noise generated by the operation of the new equipment associated with the aggregates recycling facility would also be predicted within the boundaries of the environmentally sensitive area's which border the site and assessed in accordance with the guidance contained in AQTAG09 which provides guidance on industrial noise and its effects on wildlife; and
  - All construction and operational noise levels would be predicted using the proprietary software-based noise model, Cadna/A with the

calculation algorithms set out in ISO9613 and BS5228 being utilised where appropriate.

- 8.4 Summaries of all the British Standards and other associated guidance mentioned above are shown below.

### *British Standard 5228:2009*

- 8.5 British Standard 5228-1:2009 *Code of practice for noise and vibration control on construction and open sites - Part 1: Noise and Part 2: Vibration* sets out a methodology for predicting noise and vibration levels arising from a wide variety of construction and related activities. BS5228-1:2009 also sets out tables of sound power levels generated by a wide variety of mobile equipment.

- 8.6 Noise levels generated by the site operations and experienced at local receptors will depend upon a number of variables, the most significant of which are:

- the amount of noise generated by plant and equipment being used at the development site, generally expressed as a sound power level;
- the periods of operation of the plant at the development site, known as the “on-time”;
- the distance between the noise source and the receptor, known as the “stand-off”;
- the attenuation due to ground absorption or barrier screening effects; and
- reflections of noise due to the presence of hard vertical faces such as walls.

- 8.7 The noise predictions in this section have been undertaken using a proprietary software-based noise model, Cadna/A, which implements the full range of UK calculation methods.

- 8.8 BS5228-1:2009 gives several examples of acceptable limits for construction or demolition noise. The most simplistic being based upon the exceedance of fixed noise limits and states in paragraph E.2:

*“Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut.”*

- 8.9 Paragraph E.2 goes on to state:

*“Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:*

- *70 decibels (dBA) in rural, suburban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas.*

*These limits are for daytime working outside living rooms and offices.”*

- 8.10 BS5228:2009 Part 2: *Vibration* gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels.
- 8.11 The majority of people are known to be very sensitive to vibration, the threshold of perception being typically in the peak particle velocity (PPV) range of between  $0.14\text{mms}^{-1}$  and  $0.30\text{mms}^{-1}$ . Vibration levels above these values can cause disturbance.
- 8.12 BS5228-2:2009 provides guidance on the effects of vibration shown in Table 8-1.

**Table 8-1  
Guidance on the Effects of Vibration Levels**

Vibration Level, $\text{mms}^{-1}$	Effect
0.14	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.30	Vibration might be just perceptible in residential environments.
1.00	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
10.00	Vibration is likely to be intolerable for any more than a very brief exposure to this level.

### *British Standard 5228:2009 – Haul Route*

- 8.13 British Standard 5228:2009 ‘*Noise and vibration control on construction and open sites, Part 1: Noise*’ sets out a methodology for predicting noise levels for plant using a regular well-defined haul route as outlined below.
- 8.14 The prediction of  $L_{Aeq}$  from mobile plant using a regular route, such as HGV movements to and from the Site, can be used when items of mobile plant pass at a known rate of vehicles per hour.
- 8.15 For mobile items of plant that pass at intervals (such as vehicles on an access road), it is possible to predict an equivalent continuous sound level using the following method.
- 8.16 The general expression for predicting the  $L_{Aeq}$  alongside a haul road used by single engine items of plant is:

$$L_{Aeq} = L_{WA} - 33 + 10\log_{10} Q - 10\log_{10} V - 10\log_{10} d$$

Where;

- $L_{WA}$  is the sound power level of the plant in decibels (dB);
- Q is the number of vehicles per hour;
- V is the average vehicle speed in kilometres per hour (km/h); and

- $d$  is the distance of receiving position from the centre of the haul road in metres (m).
- 8.17 Estimates of the  $L_{Aeq}$  from a haul road used by other types of mobile plant with twin engines can be made by adding a further 3dB(A) to the calculated  $L_{Aeq}$ .

### *Draft Guidelines for Noise Impact Assessment*

- 8.18 The *Draft Guidelines for Noise Impact Assessment* produced by the Institute of Acoustics/Institute of Environmental Management and Assessment Working Party have been referenced in relation to the potential changes in road traffic noise levels as a result of the operational use of the proposed facility.
- 8.19 The findings of the Working Party are draft at present although they are of some assistance in this assessment. The draft guidelines state that for any assessment, the noise level threshold and significance should be determined by the assessor, based upon the specific evidence and likely subjective response to noise.
- 8.20 The impact scale adopted in this assessment is shown in Table 8-2 below.

**Table 8-2**  
**Impact Scale for Comparison of Future Noise against Existing Noise**

Noise Level Change dB(A)	Subjective Response	Significance
0	No change	None
0.1 – 2.9	Barely perceptible	Minor
3.0 – 4.9	Noticeable	Moderate
5.0 – 9.9	Up to a doubling or halving of loudness	Substantial
10.0 or more	More than a doubling or halving of loudness	Major

- 8.21 The criteria above reflect the key benchmarks that relate to human perception of sound. A change of 3dB(A) is generally considered to be the smallest change in environmental noise that is perceptible to the human ear. A 10dB(A) change in noise represents a doubling or halving of the noise level. The difference between the minimum perceptible change and the doubling or halving of the noise level is split to provide greater definition to the assessment of changes in noise level.
- 8.22 It is considered that the criteria specified in the above table provide a good indication as to the likely significance of changes on noise levels in this case and have been used to assess the impact of the operational noise.

### *British Standard 4142:1997*

- 8.23 British Standard 4142:1997 *Method for rating industrial noise affecting mixed residential and industrial areas* is intended to be used to assess whether noise from factories, industrial premises or fixed installations and sources of

an industrial nature in commercial premises, is likely to give rise to complaints from people residing in nearby dwellings.

- 8.24 The procedure contained in BS4142 for assessing the likelihood of complaint, is to compare measured or predicted noise levels from the source in question immediately outside the dwelling, the '*specific noise level*', with the background noise level.
- 8.25 The standard is not suitable for the assessment of complaint when the background and rating noise levels are both very low; very low background noise levels are defined as those below 30dB  $L_{A90}$ , very low rating noise levels are defined as those below 35dB  $L_{Ar,T}$ . The specific noise level is measured in terms of a  $L_{Aeq,T}$  value and the background noise level is measured in terms of  $L_{A90}$  value.
- 8.26 Where the specific noise contains a '*distinguishable discrete continuous note (whine, hiss, screech, hum etc.) or if there are distinct impulses in the noise (bangs, clicks, clatters or thumps), or if the noise is irregular enough to attract attention*' then a correction of +5dB is added to the specific noise level to obtain the 'rating level', or  $L_{Ar,T}$ .
- 8.27 The likelihood of noise provoking complaints is assessed by subtracting the background noise level from the rating noise level. BS4142 states:
- 8.28 *"A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely."*

### AQTAG09

- 8.29 AQTAG09 provides guidance to assist planning officers involved with PPC applications for installations with relevant noise emissions and relate these to the requirements of the habitats regulations.
- 8.30 The habitat regulation specifies that where specific noise from industry, measured at the habitat/nest site is below the levels in Table 8-3 it is considered unlikely that it will have an adverse impact on designated species. Where levels are exceeded further, more detailed assessment will be required.

**Table 8-3**  
**Specific Noise Levels at Habitat/Nest Site**

Parameter	Noise Level, dB
$L_{Amax,F}$	80
$L_{Aeq,1hr}$	55

### *Habitats Directive*

- 8.31 EU Directive 92/43/EC on the Conservation of Natural Habitats and Wild Fauna and Flora, as known as the Habitats Directive, provides legal protection for habitats and species of European importance.
- 8.32 Articles 6(3) and 6(4) of the Habitats Directive establish a requirement for competent authorities to undertake appropriate assessments of any development that may be likely to have a significant impact upon SSSI/SPA and Ramsar sites.
- 8.33 A number of factors need to be considered when determining the effect of a development on a SSSI/SPA site is significant. These may include but not necessarily limited to:
- The character of the existing environment;
  - Magnitude, duration and extent of the effect;
  - Accuracy of noise predictions;
  - Current environmental standards; and
  - Scope of mitigation measures available.
- 8.34 The Habitats Directive and Regulations do not specify how the assessment should be undertaken. Therefore, an assessment has been made of the potential impact of noise generated by operational activities associated with the proposed aggregate recycling facility on the Sites of Special Scientific Interest (SSSI) adjacent to the development using the guidance contained in AQTAG09.

### *ISO9613*

- 8.35 The noise levels generated by the operation of fixed plant at the proposed development have been predicted in accordance with the noise prediction framework set out in ISO 9613-2 *Acoustics – Attenuation of sound during propagation outdoors – Part 2 General method of calculation*.
- 8.36 The model takes into account the distance between the sources and the receptors and the amount of attenuation due to atmospheric and ground absorption.
- 8.37 The model also assumes downwind propagation, i.e. a wind direction that assists the propagation of noise from the source to all receptors.

### **Sources of Information**

- 8.38 Information regarding the proposed development, including the fixed and mobile plant associated with both the construction and operation of the proposed facility, operational hours and proposed vehicle movements to and from the site, has been provided by the client and/or their sub-consultants.

### APPROACH TO THE ASSESSMENT

- 8.39 The assessment considers the likely noise levels that would be generated by the construction and operation of the proposed aggregate recycling facility at the identified nearby noise-sensitive receptors.
- 8.40 An assessment has been made of the baseline situation and the potential impact of the proposals. Environmental impacts have been identified and where appropriate, mitigation measures and/or scheme changes to offset potentially adverse environmental impacts have been identified.

### BASELINE CONDITIONS

- 8.41 Environmental noise surveys were undertaken on the 10<sup>th</sup>, 11<sup>th</sup> January and 2<sup>nd</sup> February 2013 to capture typical background and ambient noise levels at the closest noise-sensitive receptors to the site. During the weekday monitoring the site was operating normally with the delivery and processing of material. During the Saturday monitoring there was no material being processed at the site, though material was still being intermittently delivered.
- 8.42 The noise monitoring equipment used during the surveys is detailed in Appendix 8/B. All noise monitoring equipment was calibrated before and after the measurements and no calibration drifts were found to have occurred. The equipment had been calibrated to a traceable standard by UKAS-accredited laboratories within the 24 months preceding the surveys.
- 8.43 Daytime noise measurements were undertaken at the noise-sensitive locations agreed with Hampshire County Council, namely;
- Location 1: Busta Farm to the north of the site;
  - Location 2: Hill House to the west of the site;
  - Location 3: Hawker's Lodge to the south of the site;
  - Location 4: Welsh Drive Bridleway/Bramshill SSSI to the north of the site;
  - Location 5: Sir Richard's Bridleway/Bramshill SSSI to the south of the site; and
  - Location 6: Residential properties on Star Hill to the south-east of the site.
- 8.44 It must be noted that the measurement position at Location 4 was approximately 365m to the north-west of the centre of the site to ascertain representative prevailing noise levels within the SSSI without a major contribution of existing site activities. An additional reading was also undertaken on a Saturday at the boundary of the site closest to the Welsh Drive bridleway, for the purposes of this assessment this position will be known as Location 4A.
- 8.45 Weekday noise measurements were not taken at Location 5 to the south of the site as at the time of the survey the bridleway was being utilised as a haulage route for the quarry site and therefore representative prevailing noise levels could not be recorded.

- 8.46 The noise monitoring locations described above are shown on the noise monitoring location drawing in Appendix 8/C
- 8.47 Locations 1, 2 and 3 are considered as being representative of the nearest residential receptors to the proposed development site, whilst locations 4, 4A and 5 are considered to be the nearest environmental receptors.
- 8.48 Locations 1, 2 and 6 are considered being representative of the nearest residential receptors that potentially could be affected by the noise generated by all construction and operational traffic movements.
- 8.49 Noise measurements at locations 1, 2 and 3 consisted of two non-consecutive 30-minute periods during the weekday and one 30-minute period on a Saturday.
- 8.50 Noise measurements at Location 4 consisted of a single 1-hour period during the weekday and one 30-minute period on a Saturday. At location 4A a single 15-minute measurement was taken on a Saturday.
- 8.51 Noise measurements at Locations 5 and 6 consisted of one 15-minute reading on a Saturday.
- 8.52 At the measurement positions the following noise level indices were recorded:
- $L_{Aeq,T}$  – The A-weighted equivalent continuous noise level over the measurement period.
  - $L_{A90}$  – The A-weighted noise level exceeded for 90% of the measurement period. This parameter is often used to describe background noise.
  - $L_{A10}$  – The A-weighted noise level exceeded for 10% of the measurement period. This parameter is often used to describe road traffic noise.
  - $L_{Amax}$  – The maximum A-weighted noise level during the measurement period.
- 8.53 The weather conditions during the survey periods were acceptable for noise monitoring, being dry and clear with no precipitation.
- 8.54 The microphone was placed 1.5m above the ground in free-field conditions, i.e. at least 3.5m from the nearest vertical, reflecting surface.
- 8.55 The noise climate at Location 1 during the weekday and on a Saturday was dominated by road traffic using the A327, noise from existing site activities were not audible.
- 8.56 At Location 2 the weekday and Saturday noise climate consisted of distant road traffic and local activity, noise from existing site activities were not audible.
- 8.57 At Location 3 the weekday noise climate consisted of road traffic using the A327 and operational noise from the site including vehicle movements. On a Saturday the noise climate consisted entirely of road traffic using the A327.

- 8.58 The weekday noise climate at Location 4 consisted of distant operational noise from the existing site, distant road traffic noise from the A327 and the noise of wildlife. On Saturday the noise climate consisted of distant road traffic noise, the noise of heavy goods vehicles accessing the site and walkers using the bridleway.
- 8.59 The Saturday noise climate at Location 4A consisted of road traffic using the A327 and the noise of heavy goods vehicles accessing and egressing from the site.
- 8.60 The Saturday noise climate at Location 5 consisted of distant road traffic noise, wildlife and walkers using the bridleway.
- 8.61 The Saturday noise climate at Location 6 was dominated by road traffic using the A30 (Star Hill).
- 8.62 Natural sounds such as birdsong and the breeze in the trees were also audible at all of the locations during the monitoring periods.
- 8.63 A summary of the noise surveys results are presented in Table 8-4. The full survey results are presented in Appendix 8/D.

**Table 8-4**  
**Summary of Measured Noise Levels, free-field, dB**

Location	Period	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
1. Busta Farm	Midweek	59.8	44.4	64.1	75.3
	Saturday	65.4	49.4	70.3	80.1
2. Hill House	Midweek	46.7	38.3	48.7	67.7
	Saturday	52.9	45.6	52.2	80.3
3. Hawker's Lodge	Midweek	57.1	49.6	60.5	75.9
	Saturday	64.6	53.1	69.0	78.3
4. Welsh Drive Bridleway/Bramshill SSSI	Midweek	46.0	41.9	46.5	79.5
	Saturday	49.4	39.4	48.6	75.2
4A. Welsh Drive Bridleway/Bramshill SSSI	Saturday	55.9	44.4	55.7	78.6
5. Sir Richard's Bridleway/Bramshill SSSI	Saturday	53.0	47.3	54.0	71.7
6. Properties on Star Hill	Saturday	75.0	55.6	80.0	91.4

**POTENTIAL IMPACT**

**Construction Noise and Vibration**

*BS5228-1:2009 Noise Assessment*

- 8.64 It is inevitable with any development that some disturbance would be caused to those living and working nearby during construction works. However, disruption due to construction is a localised phenomenon and is temporary in nature.
- 8.65 Although there are techniques available to predict the likely noise effects from construction works, such as those contained in BS5228-1:2009 they are necessarily based on quite detailed information on the type and number of plant being used, their location within the site and the length of time they are in operation.
- 8.66 An estimate of the likely effects of the construction of the earth bund has been made for residential receptors closest to the site. The predictions are based on the methodology contained within BS5228-1:2009 over the core working day and reflect the currently available construction information. The predictions assume that no mitigation measures have been implemented, such as those identified later in this section.
- 8.67 The predicted noise levels have been assessed against an external façade criterion of 70dB  $L_{Aeq,1hr}$  and against the existing ambient noise levels in the area. The derivation of the 70dB criterion is contained earlier in this section.
- 8.68 It has been confirmed by the client that to construct the bund the plant shown in Table 8-5 below would be utilised. The table also shows their associated sound power levels, estimated on-times and equivalent continuous sound power levels.

**Table 8-5  
Construction Plant, dB**

Plant Description	Location on site	Sound Power level dB(A)	Estimated On-time %	Equivalent Continuous $L_{WA}$ dB
CAT D6R Dozer	South and east boundaries	118	83	117
Hitachi 210 Excavator		105	83	104

- 8.69 Predictions have been carried out of the noise levels likely to be generated by both items of plant working simultaneously using the methodology outlined in BS5228-1:2009.
- 8.70 Construction works are likely to be limited to the following hours:
  - Monday to Friday 08:00 to 18:00 hours; and
  - Saturday 08:00 to 13:00 hours.

- 8.71 Construction noise predictions assume a worst-case scenario where works are being undertaken on the area of the bund closest to each residential receptor. The predicted noise levels are set out Table 8-6.
- 8.72 It must be noted that at Location 3, Hawker’s Lodge, the predictions take into account the attenuation provided by the solid brick wall which surrounds the property.

**Table 8-6  
Predicted Construction Noise Levels**

Location	Predicted Noise Level Façade $L_{Aeq,1hr}$ , dB
1. Busta Farm	50.8
2. Hill House	52.1
3. Hawker’s Lodge	69.5

- 8.73 Table 8-6 indicates that the predicted noise levels from all works associated with the construction of the earth bund are below the 70dB criterion adopted for this assessment at all of the locations assessed.
- 8.74 With reference to the above mitigation measures to reduce the noise impact of construction operations are considered unnecessary.

### *Heavy Goods Vehicle Movements – Construction Operations*

- 8.75 The predicted noise level produced by heavy goods vehicle (HGV) movements associated with the construction of the earth bund has been calculated using the methodology contained in BS5228-1:2009. Calculations have been undertaken using the proprietary noise modelling software Cadna/A.
- 8.76 The traffic assessment (refer to Chapter 6 of the ES) has advised that in a worst-case hour there would be six HGV’s accessing the site and eight HGV’s exiting the site, equating to 14 movements. The applicant has advised that all goods vehicle movements would take place during the daytime; as a result a night-time noise assessment for these movements has not been carried out.
- 8.77 The former Department of Transport document *Calculation of Road Traffic Noise* (CRTN, 1988) states that calculations of noise level for traffic flows below 50 vehicles per hour or 1000 vehicles per 18 hour day are unreliable and measurements should be taken when evaluating such cases. However, as this is a construction assessment the noise generated by HGV movements has been predicted using the haul route method outlined in BS5228: 2009. The impact of noise from heavy goods vehicles has been assessed against the existing ambient noise levels. A sound power level of 105dB(A) has been attributed to each HGV and it assumed that speeds will be equal to the permitted speed limits on the surrounding road network.
- 8.78 Table 8-7 shows the predicted noise level produced by heavy goods vehicle movements at the site. It is assumed that 20% (three HGV movements) will enter the site from the north on the A327 with the remainder entering from the south on the A327 via the A30.

**Table 8-7**  
**Predicted Noise Levels from Construction Traffic Movements, free-field,  $L_{Aeq1hr}$  dB**

Location	Predicted $L_{Aeq1hr}$
1. Busta Farm	46.1
2. Hill House	38.5
3. Hawker's Lodge	54.4
6. Star Hill	57.3

8.79 The future ambient noise levels including the proposed HGV movements associated with the construction of the earth bund, at the closest noise-sensitive receptors have been calculated by logarithmically adding the above total predicted HGV noise levels to the existing ambient noise levels.

8.80 Table 8-8 compares the predicted future ambient noise levels with the impact scale adopted for this assessment.

**Table 8-8**  
**Predicted Ambient Noise Levels from Construction Traffic Movements, free-field,  $L_{Aeq,T}$  dB**

Location	Period	Existing Ambient Noise Level	Predicted Ambient Noise Level	Change	Impact
1. Busta Farm	Midweek	59.8	60.0	+0.2	Minor
	Saturday	59.7*	59.9	+0.2	Minor
2. Hill House	Midweek	46.7	47.3	+0.6	Minor
	Saturday	52.9	53.1	+0.2	Minor
3. Hawker's Lodge	Midweek	57.1	59.0	+1.9	Minor
	Saturday	64.6	65.0	+0.4	Minor
6. Star Hill	Saturday	75.0	75.1	+0.1	Minor

\* distance correction applied

8.81 Due to problems with access at Location 1 on Saturday the noise meter had to be placed closer to the A327 than was the case during the weekday period, 13m as opposed to 48m, therefore a distance correction of -5.7dB has been applied to the measured Saturday noise level at this location.

8.82 Table 8-8 indicates that worst case noise levels generated by heavy goods vehicles associated with the construction of the earth bund would have a minor, barely perceptible, impact at all of the receptors assessed during both the midweek and on a Saturday.

8.83 On the basis that noise levels generated by heavy goods vehicle movements would have a minor impact at worst, mitigation measures are considered unnecessary.

### Construction Vibration

- 8.84 BS5228-2:2009: *Vibration* gives recommendations for controlling vibration on construction and open sites; however due to the fact that the construction of the earth bund will only involve the use of a dozer and an excavator without the need for piling or vibratory compaction, it is considered that there is no requirement for a full construction vibration assessment to be undertaken.

## OPERATIONAL NOISE ASSESSMENT

### Operational Plant

- 8.85 The client has provided details of the proposed additional plant to be installed as part of the new aggregates recycling facility.
- 8.86 Drawing number SA13-005 produced by DUO (Europe) plc shows the proposed aggregates recycling facility including operational noise levels at given distances at various positions around the plant. This drawing is included in Appendix 8/E.
- 8.87 With reference to the drawing and for the purposes of this assessment the noise levels measured at 1m away from the plant have been utilised in the Cadna/A noise model.
- 8.88 The approximate location of the wash plant ss shown in Appendix 8/F.

### *BS4142 Assessment*

- 8.89 An assessment has been carried out in accordance with the guidance contained in BS4142 to determine whether noise emissions from the fixed plant associated with the proposed aggregates recycling facility are likely to give rise to complaints from occupants of the nearby noise-sensitive residential receptors.
- 8.90 Using the operational noise levels measured at 1m away from the plant the noise levels generated by the proposed aggregates recycling facility have been predicted at the nearest residential receptors using the proprietary software-based noise model, Cadna/A, which implements the full range of UK calculation methods. In this instance, the calculation algorithms set out in ISO9613 have been used. It must also be noted that the predictions include the noise generated by a single loading shovel loading material into the facility.
- 8.91 For the purposes of this assessment the predictions are based on the following percentages of soft ground between the aggregates recycling facility and each residential receptor;
- Busta Farm – 80%
  - Hill House – 90%
  - Hawker's Lodge – 70%

- 8.92 It is assumed that the plant will have some intermittent noise sources or noise sources that will be variable in nature, therefore an acoustic feature correction of +5dB has been added to the noise level to give a noise rating level,  $L_{Ar,T}$ . The rating levels have then been compared to the measured background noise levels.
- 8.93 The BS4142 assessment is shown in Table 8-9 below. It must be noted that at Location 3, Hawker’s Lodge, the predictions take into account the attenuation provided by the solid brick wall which surrounds the property.

**Table 8-9**  
**BS4142 Assessment, free-field, dB**

Location	Period	Measured Background Noise Level	Predicted Rating Level	Difference dB
		$L_{A90}$	$L_{Ar,T}$	
1. Busta Farm	Midweek	44.4	39.7	-4.7
	Saturday	43.7*		-4.0
2. Hill House	Midweek	38.3	39.8	+1.5
	Saturday	45.6		-5.8
3. Hawker’s Lodge	Midweek	49.6	44.5	-5.1
	Saturday	53.1		-8.6

\* distance correction applied

- 8.94 Due to problems with access at Location 1 on Saturday the noise meter had to be placed closer to the A327 than was the case during the weekday period, 13m as opposed to 48m, therefore a distance correction of -5.7dB has been applied to the measured Saturday noise level at this location.
- 8.95 BS4142 states:
- “A difference of around 10dB or higher indicates that complaints are likely. A difference of around 5dB is of marginal significance. A difference of -10dB is a positive indication that complaints are unlikely”.*
- 8.96 Table 8-9 indicates that noise rating levels generated by the proposed aggregates recycling facility would lead to a situation between marginal significance and a positive indication that complaints would be unlikely at all the locations assessed during both the weekday and Saturday periods.

### Operational Heavy Goods Vehicle Movements

- 8.97 The predicted noise level produced by heavy goods vehicle (HGV) movements associated with the normal operation of the aggregates recycling facility has been calculated using the methodology contained in BS5228-1:2009. Again, calculations have been undertaken using the proprietary noise modelling software Cadna/A.
- 8.98 The traffic assessment (refer to Chapter 6 of the ES) has advised that in a worst-case hour there would be nine HGV’s accessing the site and 14 HGV’s

exiting the site, equating to 23 movements. The applicant has advised that all goods vehicle movements would take place during the daytime; as a result a night-time noise assessment for these movements has not been carried out.

- 8.99 The former Department of Transport document *Calculation of Road Traffic Noise* (CRTN, 1988) states that calculations of noise level for traffic flows below 50 vehicles per hour or 1000 vehicles per 18 hour day are unreliable and measurements should be taken when evaluating such cases. However, as the aggregates recycling facility is not yet operational, the noise generated by HGV movements has been predicted using the haul route method outlined in BS5228: 2009. The impact of noise from heavy goods vehicles has been assessed against the existing ambient noise levels. A sound power level of 105dB(A) has been attributed to each HGV and it assumed that speeds will be equal to the permitted speed limits on the surrounding road network.
- 8.100 Table 8-10 shows the predicted noise level produced by operational heavy goods vehicle movements at the site. It is assumed that 20% (five HGV movements) will enter the site from the north on the A327 with the remainder entering from the A327 via the A30 to the south.

**Table 8-10**  
**Predicted Noise Levels from Traffic Movements, free-field,  $L_{Aeq1hr}$  dB**

Location	Predicted $L_{Aeq1hr}$
1. Busta Farm	46.6
2. Hill House	39.0
3. Hawker's Lodge	56.1
6. Star Hill	58.1

- 8.101 The future ambient noise levels including the proposed HGV movements, at the closest noise-sensitive receptors have been calculated by logarithmically adding the above total predicted HGV noise levels to the existing ambient noise levels.
- 8.102 Table 8-11 compares the predicted future ambient noise levels with the impact scale adopted for this assessment.

**Table 8-11**  
**Predicted Ambient Noise Levels from Traffic Movements,**  
**free-field,  $L_{Aeq,T}$  dB**

Location	Period	Existing Ambient Noise Level	Predicted Ambient Noise Level	Change	Impact
1. Busta Farm	Midweek	59.8	60.0	+0.2	Minor
	Saturday	59.7*	59.9	+0.2	Minor
2. Hill House	Midweek	46.7	47.4	+0.7	Minor
	Saturday	52.9	53.1	+0.2	Minor
3. Hawker's Lodge	Midweek	57.1	59.6	+2.5	Minor
	Saturday	64.6	65.2	+0.6	Minor
6. Star Hill	Saturday	75.0	75.1	+0.1	Minor

\* distance correction applied

- 8.103 Due to problems with access at Location 1 on the Saturday the noise meter had to be placed closer to the A327 than was the case during the weekday period, 13m as opposed to 48m, therefore a distance correction of -5.7dB has been applied to the measured Saturday noise level at this location.
- 8.104 Table 8-11 indicates that noise levels generated by heavy goods vehicles associated with the normal operation of the materials recycling facility would have at worst a minor, barely perceptible, impact at all of the receptors assessed.
- 8.105 On the basis that noise levels generated by heavy goods vehicle movements would have a minor impact at worst, mitigation measures are considered unnecessary.

### *Cumulative Impacts*

- 8.106 The noise levels generated by the operational processes have been assessed against standards appropriate for each type of source considered; BS4142 for the operation of the fixed plant associated with the aggregates recycling facility and the existing ambient noise levels for the assessment of HGV traffic movements. The scope of BS4142 specifically excludes the assessment of mobile noise sources and is not appropriate for the assessment of cumulative impacts.
- 8.107 Table 8-12 summarises the cumulative impact of fixed plant (specific noise) and HGV movements at Locations 1, 2 and 3. The cumulative noise levels have been assessed against the existing ambient noise levels and the potential change has been compared to the impact scale adopted for this assessment.

**Table 8-12**  
**Cumulative Impact Assessment of Fixed Plant and HGV Movements, Free-field**  
 **$L_{Aeq,T}$  dB**

Location	Period	Existing Ambient Noise Level	Predicted Ambient Noise Level	Change	Impact
1. Busta Farm	Midweek	59.8	60.0	+0.2	Minor
	Saturday	59.7	59.9	+0.2	Minor
2. Hill House	Midweek	46.7	47.6	+0.9	Minor
	Saturday	52.9	53.1	+0.4	Minor
3. Hawker's Lodge	Midweek	57.1	59.7	+2.6	Minor
	Saturday	64.6	65.2	+0.6	Minor

8.108 It can be seen from Table 8-12 that the cumulative impact of the operation of fixed plant at the proposed aggregates recycling facility and the movement of associated heavy goods vehicle movements would, at worst, have a minor, barely perceptible impact at all of the nearest residential noise sensitive receptors assessed.

8.109 In view of the above mitigation measures are considered unnecessary.

### *AQTAG09 Assessment*

8.110 An assessment has been carried out to determine whether the noise generated by the operation of the proposed aggregates recycling facility would have an impact on the Welsh Drive Bridleway/Bramshill SSSI and the Sir Richard's Bridleway/Bramshill SSSI to the north and south of the site respectively.

8.111 Table 8-13 below shows the predicted noise levels produced by the facility at the boundaries of the Welsh Drive Bridleway/Bramshill SSSI and the Sir Richard's Bridleway/Bramshill SSSI nearest to the proposed site. The table also shows the predicted noise level at the noise monitoring location associated with Location 4 approximately 365m to the north-west of the centre of the site.

8.112 It must be noted that the predicted noise levels include the noise generated by the aggregates recycling facility and all the HGV movements associated with the site. The predictions are based on 80% soft ground between the aggregates recycling facility and locations 4 & 5 and 50% soft ground between the aggregates recycling facility and Location 4A.

**Table 8-13**  
**Predicted Noise Levels, free-field, dB**

Location	Predicted $L_{Aeq,1hr}$
4A. Welsh Drive/Bramshill SSSI – Nearest Boundary	51.1
4. Welsh Drive/Bramshill SSSI – Monitoring Position	42.0
5. Sir Richard’s Bridleway SSSI – Nearest Boundary	50.1

8.113 The predicted noise levels shown in the above table have been compared to the guidance noise levels contained in AQTAG09 as shown in Table 8-14 below.

**Table 8-14**  
**AQTAG09 Noise Assessment**

Location	Predicted Noise Level $L_{Aeq,1hr}$	AQTAG 09 Noise Limit	Difference
4A. Welsh Drive/Bramshill SSSI – Nearest Boundary	51.1		-3.9
4. Welsh Drive/Bramshill SSSI – Monitoring Position	42.0	55.0	-7.0
5. Sir Richard’s Bridleway SSSI – Nearest Boundary	50.1		-4.9

8.114 It can be seen from the above table that predicted noise levels from the aggregates recycling facility and associated traffic movements are below the noise limits specified in AQTAG09 at all of the environmental receptors assessed.

8.115 Further to the above, and to assess the potential impacts of the noise generated by the proposed aggregates recycling facility on the existing ambient noise levels within the SSSI’s, the predicted noise levels have been logarithmically added to the measured ambient noise levels and the total noise levels compared to the impact scale adopted for this assessment. The assessment is shown in Table 8-15 below

**Table 8-15**  
**Ambient Noise level Impact Assessment, Free-field  $L_{Aeq,T}$  dB**

Location	Period	Existing Ambient Noise Level	Predicted Ambient Noise Level	Change	Impact
4A. Welsh Drive/Bramshill SSSI – Nearest Boundary	Saturday	55.9	57.1	+1.2	Minor
	Midweek	46.7	48.0	+1.3	Minor
4. Welsh Drive/Bramshill SSSI – Monitoring Position	Saturday	49.4	50.1	+0.7	Minor
	Saturday	53.0	54.8	+1.8	Minor

### Nearest Boundary

- 8.116 It can be seen from Table 8-15 that the cumulative impact of the operation of fixed plant at the proposed aggregates recycling facility and the movement of associated heavy goods vehicles would, at worst, have a minor barely perceptible impact within the adjacent SSSI's.
- 8.117 It must also be noted that on Saturday at Location 4A, when no material was being processed, the existing ambient noise level is already above the specified limit in AQTAG09 and at Location 5 the existing ambient noise level is only 2.0dB below the limit.

## CONCLUSIONS

- 8.118 The assessment has considered the potential of construction and operational proposals to give rise to noise impacts at the closest residential and environmental noise-sensitive receptors.
- 8.119 The assessments has shown that:
- predicted noise levels from works associated with the construction of the earth bund are below the 70dB criterion adopted for this assessment at all of the locations assessed;
  - noise levels generated by heavy goods vehicles associated with the construction of the earth bund would have at worst a minor, barely perceptible, impact at all of the receptors assessed during both the midweek and on a Saturday
  - operational noise rating levels from the fixed and mobile plant associated with the aggregates recycling facility are predicted to give rise to a situation between marginal significance and complaints unlikely at all the locations assessed during both the midweek and on Saturday;
  - noise levels generated by heavy goods vehicles associated with the normal operation of the materials recycling facility would have at worst a minor, barely perceptible, impact at all of the receptors assessed during both the midweek and on Saturday;
  - the cumulative impact of the operation of fixed plant at the proposed aggregates recycling facility and the movement of associated heavy goods vehicle movements would, at worst, have a minor, barely perceptible impact at all of the nearest residential noise sensitive receptors assessed during both the midweek and on Saturday; and
  - predicted noise levels from the aggregates recycling facility and associated traffic movements are also below the noise limits specified in AQTAG09 within the SSSI's located adjacent to the site
- 8.120 It is considered that based on the results of the assessments, noise should not pose a material constraint for the proposed development.

**APPENDIX 8/A – GLOSSARY OF TERMINOLOGY**

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

**Table A8-1  
Sound Levels Commonly Found in the Environment**

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside a factory
100 to 110dB(A)	Burglar alarm at 1 metre away
110 to 130dB(A)	Jet aircraft on take-off
140dB(A)	Threshold of pain

**Acoustic Terminology**

**dB (decibel)** The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ( $2 \times 10^{-5} \text{Pa}$ ).

**dB(A)** A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

**L<sub>Aeq</sub>** L<sub>Aeq</sub> is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.

**L<sub>10</sub> & L<sub>90</sub>** If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L<sub>n</sub> indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L<sub>10</sub> is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L<sub>90</sub> is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L<sub>10</sub> index to describe traffic noise.

$L_{Amax}$   $L_{Amax}$  is the maximum A-weighted sound pressure level recorded over the period stated.  $L_{Amax}$  is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall  $L_{eq}$  noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

APPENDIX 8/B - NOISE MONITORING EQUIPMENT

**Table B8-1  
Noise Monitoring Equipment**

Location	Period	Description	Serial No.
1. Busta Farm	Midweek	Cirrus 171B Type 1 SLM	G061094
		Cirrus 513A Acoustic Calibrator	32327
	Weekend	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821
2. Hill House	Midweek	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821
	Weekend	Cirrus 831B Type 1 SLM	C17175FF
		Cirrus 511E Acoustic Calibrator	36342
3. Hawker's Lodge	Midweek	Cirrus 171B Type 1 SLM	G061094
		Cirrus 513A Acoustic Calibrator	32327
	Weekend	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821
4 & 4A Welsh Drive/Bramshill SSSI	Midweek	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821
	Weekend	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821
5. Sir Richard's Bridleway	Weekend	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821
6. Star Hill	Weekend	Norsonic Nor140 Type 1 SLM	1403009
		Norsonic Nor1251 Acoustic Calibrator	31821

**APPENDIX 8/C – NOISE MONITORING LOCATION DRAWING**

APPENDIX 8/D – FULL SURVEY RESULTS

**Table A8-1**  
**Measured Noise Levels at Location 1 – Busta Farm, free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
10/01/13	13:21	59.2	43.4	63.6	72.6
	14:49	60.3	45.3	64.5	75.3
	11:04	64.0	49.8	69.2	76.2
	11:09	65.7	47.7	70.6	77.1
02/02/13	11:14	66.1	51.6	70.4	80.0
	11:19	66.3	50.2	71.0	78.3
	11:24	65.3	48.5	70.3	80.1
	11:29	64.8	48.4	70.0	76.7

Time period T was 30 minutes on the 10/01/13 and 5 minutes on the 02/02/13.

**Table A8-2**  
**Measured Noise Levels at Location 2 – Hill House, free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
10/01/13	12:30	46.5	38.7	48.8	62.9
	15:00	46.9	37.8	48.6	67.7
	10:00	48.5	45.6	50.4	53.9
	10:35	57.7	45.8	52.7	80.3
02/02/13	11:35	51.4	46.7	51.1	67.7
	11:40	51.8	45.8	54.4	65.4
	11:45	49.7	45.2	52.0	60.0
	11:50	50.8	44.3	52.4	63.7

Time period T was 30 minutes on the 10/01/13 and 5 minutes on the 02/02/13.

**Table A8-3**  
**Measured Noise Levels at Location 3 – Hawker’s Lodge, free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
10/01/13	12:41	56.6	47.9	60.1	71.9
	14:12	57.5	51.2	60.8	75.9
	10:05	63.6	51.0	68.7	75.0
	10:10	66.3	56.6	70.2	78.3
02/02/13	10:15	64.4	52.8	69.3	76.1
	10:20	64.8	53.9	68.9	76.7
	10:25	64.1	50.9	68.4	78.0
	10:30	64.1	53.2	68.6	74.7

Time period T was 30 minutes on the 10/01/13 and 5 minutes on the 02/02/13.

**Table A8-4**  
**Measured Noise Levels at Location 4 – Welsh Drive/Bramshill SSSI**  
**free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
11/01/13	10:15	47.8	45.5	49.5	56.8
	10:30	47.7	43.6	47.8	79.5
	10:45	44.4	40.6	46.9	57.2
	11:00	40.4	37.7	41.9	52.7
02/02/13	09:00	45.0	39.9	48.1	60.8
	09:05	53.8	39.6	50.9	75.2
	09:10	43.1	38.5	45.8	52.3
	09:15	45.6	40.6	49.0	56.5
	09:20	52.2	36.8	51.3	71.6
	09:25	44.7	40.7	46.7	55.3

Time period T was 15 minutes on the 11/01/13 and 5 minutes on the 02/02/13

**Table A8-5**  
**Measured Noise Levels at Location 4A – Welsh Drive/Bramshill SSSI**  
**Nearest Boundary, free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
02/02/13	09:32	50.1	44.1	52.9	71.6
	09:37	49.5	43.0	52.5	58.8
	09:42	59.9	46.2	61.7	78.6

Time period T was 5 minutes

**Table A8-6**  
**Measured Noise Levels at Location 5 – Sir Richard’s Bridleway/Bramshill SSSI,**  
**free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
02/02/13	10:38	53.8	47.9	54.1	71.7
	10:43	52.9	47.3	53.9	69.6
	10:48	52.1	46.6	54.1	70.7

Time period T was 5 minutes

**Table A8-7**  
**Measured Noise Levels at Location 6 – Properties on Star Hill, free-field, dB**

Date	Start Time	L <sub>Aeq,T</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>
02/02/13	11:51	74.8	54.2	79.5	90.7
	11:56	75.1	56.3	79.9	91.4
	12:01	75.2	56.4	80.6	88.1

Time period T was 5 minutes

**APPENDIX 8/E – OPERATIONAL NOISE LEVEL DRAWING**

**APPENDIX 8/F – PROPOSED SITE LAYOUT DRAWING**

### APPENDIX 8/G – LIMITATIONS TO THIS REPORT

This entails a physical investigation of the site with a sufficient number of sample measurements to provide quantitative information concerning the type and degree of noise affecting the site. The objectives of the investigation have been limited to establishing sources of noise material to carrying out an appropriate assessment.

The number and duration of noise measurements have been chosen to give reasonably representative information on the environment within the agreed time, and the locations of measurements have been restricted to the areas unoccupied by building(s) that are easily accessible without undue risk to our staff.

As with any sampling, the number of sampling points and the methods of sampling and testing cannot preclude the existence of “hotspots” where noise levels may be significantly higher than those actually measured due to previously unknown or unrecognised noise emitters. Furthermore, noise sources may be intermittent or fluctuate in intensity and consequently may not be present or may not be present in full intensity for some or all of the survey duration.